MONTHLY WEATHER REVIEW.

Editor: Prof. Cleveland Abbe. Assistant Editor: Frank Owen Stetson.

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INTRODUCTION.

The Monthly Weather Review for September, 1904, is based on data from about 3300 stations, classified as follows:

Weather Bureau stations, regular, telegraph, and mail, 167; West Indian Service, cable and mail, 4; River and Flood Service, regular 43, special river and rainfall, 190, special rainfall only, 56; voluntary observers, domestic and foreign, 2565; total Weather Bureau Service, 3025; Canadian Meteorological Service, by telegraph and mail, 20, by mail only, 13; Meteorological Service of the Azores, by cable, 2; Meteorological Office, London, by cable, 8; Mexican Telegraph Company, by cable, 3; Army Post Hospital reports, 18; United States Life-Saving Service, 9; Southern Pacific Company, 96; Hawaiian Meteorological Service, 75; Jamaica Weather Service, 130; Costa Rican Meteorological Service, 25; The New Panama Canal Company, 5; Central Meteorological Observatory of Mexico, 20 station summaries, also printed daily bulletins and charts, based on simultaneous observations at about 40 stations; Mexican Federal Telegraph Service, printed daily charts, based on about 30 stations.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. R. C. Lydecker, Territorial Meteorologist, Honolulu, Hawaii; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; Lieut. Commander H. M. Hodges, Hydrographer, United States Navy; H. Pittier, Director of the Physico-Geographic Institute, San José, Costa Rica; Commandant Francisco S. Chaves, Director of the Meteorological Service of the Azores, Ponta Delgada, St. Michaels, Azores; W. N. Shaw, Esq., Secretary, Meteorological Office, London; Rev. José Algué, S. J., Director, Philippine Weather Service; and H. H. Cousins, Chemist, in charge of the Jamaica Weather Office; Señor Enrique A. Del Monte, Director of the Meteorological Service of the Republic of Cuba.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the Review, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. The Hawaiian standard meridian is 157° 30′, or $10^h\ 30^m$ west of Greenwich. The Costa Rican standard meridian is that of San José, $5^h\ 36^m$ west of Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local standard is mentioned.

Barometric pressures, whether "station pressures" or "sea-level pressures," are now reduced to standard gravity, so that they express pressure in a standard system of absolute measures.

FORECASTS AND WARNINGS.

By Prof. E. B. Garriott, in charge of Forecast Division.

Low barometric pressure prevailed over the North Atlantic in the vicinity of the British Isles during the first half of the month and at its close, and from the 19th to the 23d the barometer was low on the coasts of Spain and Portugal, and high over west-central continental Europe and the British Isles. In the vicinity of the Azores high pressure prevailed and the barometric changes were not marked.

Several disturbances of moderate strength passed from the American Continent over the ocean in high latitudes, and during the 14th and 15th a disturbance that first assumed marked intensity in the subtropical region north of the West Indies moved with extraordinary speed from the south Atlantic to the New England coast, and passed thence over Newfoundland, attended along the Atlantic seaboard by exceptionally heavy rain and strong gales, which attained hurricane force at points along the middle and south Atlantic coasts. Although the approach of this storm was announced by timely advices and warnings that prompted precautionary measures, a number of lives were lost, much damage was caused to seaside property, and many causualities to shipping occurred along the Atlantic coast of the United States. The maximum wind velocity reported in connection with this storm was 100 miles an hour from the northwest at Delaware Breakwater at 2:50 a. m. of the 15th, and the rainfall exceeded 5 inches at points in the Middle Atlantic States.

The storms of the Great Lakes were of moderate intensity, and no disturbance appeared in the Gulf of Mexico. On the Pacific coast the storm period had not begun, and extreme wind velocities were not experienced.

The first important frost-producing cool wave advanced from the Northwest to the middle Mississippi Valley during the 13th, 14th, and 15th, and from the 20th to the 22d a cool wave advanced from the Northwest to the Middle Atlantic States, attended by heavy frost and the lowest temperature on record for the season in the Middle Atlantic States, a reading of 36° being noted at Washington, D. C., on the morning of the 22d. Timely warnings were issued in connection with the damaging frosts of the month.

A remarkable warm wave visited California from the 6th to the 9th, and on the 7th and 8th, the maximum temperature reached 100° at San Francisco, and 100° to 108° in the central valleys of California.

During the closing days of September, destructive floods occurred in southern Colorado, New Mexico, and Oklahoma. At Trinidad, Colo., the losses were very great, and in parts of New Mexico the floods were the most extensive and destructive in the history of the Territory.

NEW ENGLAND FORECAST DISTRICT.

The chief and about the only unusual feature of the weather of the month was the general and destructive storm of the 14–15th. The storm came on very rapidly during the afternoon of the 14th, and prevailed with great fury through the night and the morning of the 15th. Heavy gales prevailed north to Eastport and from Highland Light, Mass., to Block

Island, R. I., the winds attained hurricane force, strewing Vineyard Sound, Nantucket, Cape Cod, and the Maine coast with many wrecks. Beach property along the coast in some places suffered much damage, and there was considerable loss of life. The press of the city places the loss by damage from the wind and rain, for New England, at $1,000,000. The rainfall was very heavy, except in some of the southeastern sections of the district, the amounts reaching several inches, and the downpour caused much damage by floods and washouts to fields and roads. Remarkable and unusual phenomena attended the storm at points on the Massachusetts coast. At Woods Hole, during the early hours of the gale, the tide rose several feet above the mean high-water mark. This was followed by a drop which was as unusual as the rise, the tide dropping 7 feet in fifty minutes, and to a point 5 feet below the average. Storm warnings were ordered and bulletins issued well in advance of the storm, and doubtless resulted in the saving of many lives and much property.

The frosts, and in some sections, freezing weather on the 22d and 23d were unusually severe and early for the season. They were duly anticipated and announced in the forecasts.—*J. W. Smith, District Forecaster.*

NORTH-CENTRAL FORECAST DISTRICT.

Storm warnings were ordered up on the evening of September 1, and the morning of the 2d, for a storm that advanced northeastward from the southern Rocky Mountain region to the Lakes. High velocities were reported at many stations, but the storm lost force by the night of the 2d. Warnings were ordered on Lakes Michigan and Huron on the morning of September 20, in advance of high northerly winds which prevailed over those lakes. They were again hoisted on the eastern half of Lake Superior on the morning of September 30. The stations at Marquette and Sault Ste. Marie reported unusually high winds, the velocity attaining 56 miles per hour from the northwest at the latter station.

Frost warnings were issued several times during the month. The high pressure area which appeared in the British Northwest on the morning of the 10th advanced southeastward, and by the morning of the 12th had caused light to heavy frosts over the entire district. Another such condition, but more severe, appeared in the extreme northwest on the morning of the 12th and followed about the same course as its predecessor, and by the 15th had caused frosts over the entire district. Another high area, accompanied by frost, moved across the northern tier of States during the 20th and 21st. On account of the lateness of the corn crop, these warnings and the ensuing frosts affected in a great degree the price of corn, as it was supposed that great injury would result. However, except from a speculative point of view, these warnings were not important, because no protection from frost conditions can be afforded the growing crop. Warnings of these frosts were sent to the cranberry growers of Wisconsin, and it gave them opportunity to flood the marshes and prevent damage to the berries.—*H. J. Cox, Professor and District Forecaster.*

WEST GULF FORECAST DISTRICT.

The early part of the month was showery, and moderate temperatures prevailed. The close of the month was marked by unseasonably high temperatures, and the maximum, 94° on the 30th, broke all previous records for the last decade in September. The month was free from disturbances, and no special warnings were issued.—*I. M. Cline, District Forecaster.*

ROCKY MOUNTAIN FORECAST DISTRICT.

Apart from the heavy rainfall in New Mexico and southeastern Colorado, and the absence of destructive frosts in the principal horticultural and agricultural districts, the month was devoid of unusual conditions. Such frosts as were noted occurred in the high districts, and were well covered by the forecasts.—*F. H. Brandenburg, District Forecaster.*

SOUTH PACIFIC FORECAST DISTRICT.

A warm wave passed over California from the 6th to the 9th; it was very intense in the San Francisco Bay section on the 7th and 8th, when the previous maximum temperature recorded at San Francisco, of 100° was exceeded. In the interior valleys on these dates, the maxima ranged from 100° to 108°. Little or no damage resulted from the heat.

A well-defined storm covered the district from the 22d to the 25th, causing rain and numerous thunderstorms throughout California and Nevada. The rain was abnormally heavy in northern California, and on the northern coast of southern California. At San Francisco, where the record began in 1850, the greatest previous amount for September was 1.06 inches, against 5.07 this year. A remarkable feature of the storm was the great number of thunderstorms accompanying it. Much damage was caused in San Francisco by the water flooding basements and stopping street car traffic in the lower portions of the city. Great loss was caused to drying fruit, hay, grain, and beans in the fields, and to table and wine grapes. Ample warnings of the storm were given and generally heeded, but the rains were so heavy that protection in many cases was impossible.

Southeast storm warnings were displayed from San Francisco to Eureka at 11 a. m. on the 22d, and advisory messages sent to all southern ports. These warnings were continued on the 23d and 24th. No high winds occurred at either San Francisco or Eureka during this period, but the warnings were verified at Point Reyes and Southeast Farallon, and vessels coming into port during and since the storm reported very rough weather outside.—*G. H. Willson, District Forecaster.*

NORTH PACIFIC FORECAST DISTRICT.

The month of September was unusually dry up to the 21st, when a disturbance of moderate energy moved southward along the coast to California, causing general rain throughout the district, and moderately high southeasterly winds along the Washington coast. Southeast storm warnings were displayed at the mouth of the Columbia River, and along the Strait of Fuca, from Port Townsend westward to Cape Flattery, on the afternoon of the 21st. The rains, while generally insufficient to effectually break the long continued drought, put out the forest fires, cleared the atmosphere of smoke, and slightly revived vegetation.

Light frost, for which warnings were issued, occurred east of the Cascade Mountains on several mornings. West of the Cascades no frost of consequence occurred.—*A. B. Wollaber, District Forecaster.*

RIVERS AND FLOODS.

The Mississippi, Missouri, and Ohio rivers were considerably lower during this month than in the corresponding month of the year 1903, and more nearly approached the normal low-water conditions that are to be expected at the beginning of the autumn season. Navigation proceeded as usual on the Mississippi River, and was not seriously interrupted on the Ohio. The Tennessee River continued to fall steadily throughout the month, and readings below zero were reported at many stations; navigation had already been suspended on the upper river, and very little was possible below.

The rivers of the Atlantic system were quiet as a rule; the heavy rains of the middle of the month caused a sharp swell in all districts, but the stages reached were quite moderate except in the Roanoke and Cape Fear rivers, where danger-line stages were exceeded. At Fayetteville, N. C., the Cape Fear River rose more than 46 feet from the 14th to the 17th; warnings for this flood were issued on the 15th. Reports of the mountain floods in the Southwest have not yet been received, and they will appear at a later date. Warnings were issued on the 17th for the flood in the Rio Grande, the only

river in that section on which river and flood service is maintained.

The work of extension of the River and Flood Service has progressed steadily since July 1, 1904, the date on which the increased appropriation for that purpose became available, and by the end of September new stations had been established as follows:

Milk River, Havre, Mont.; Big Blue River, Blue Rapids, Kans.; Republican River, Clay Center, Kans.; Solomon River, Beloit, Kans.; Smoky Hill River, Lindsborg, Kans., Abilene, Kans.; Kansas River, Manhattan, Kans., Topeka, Kans.; Gasconade River, Arlington, Mo.; Missouri River, Blair, Nebr.; Minnesota River, Mankato, Minn.; St. Croix River, Stillwater, Minn.; Red Ceder River, Cedar Rapids, Iowa; Iowa River, Iowa City, Iowa; Scioto River, Circleville, Ohio; Kentucky River, Jackson, Ky.; Powell River, Tazewell, Tenn.; Little Tennessee River, McGhee, Tenn.; St. Francis River, Marked Tree, Ark.; Neosho River, Neosho Rapids, Kans., Iola, Kans., Oswego, Kans., Fort Gibson, Ind. T.; Canadian River, Calvin, Ind. T.; Black River, Blackrock, Ark.; White River, Calicorock, Ark., Batesville, Ark., Clarendon, Ark.; Arkansas River, Tulsa, Ind. T.; Mississippi River, St. Cloud, Minn., Warsaw, Ill., Luxora, Ark.; Lehigh River, Mauchchunk, Pa.; Schuylkill River, Reading, Pa.; Delaware River, Hancock, N. Y. (east branch), Hancock, N Y. (west branch), Port Jervis, N. Y., Phillipsburg, N. J., Trenton, N. J.; Catawba River, Mount Holly, N. C.; Oconee River, Milledgeville, Ga.; Yuba River, Colgate, Cal.; Sacramento River, Knights Landing, Cal., Riovista, Cal.

Nineteen rainfall stations have also been established, and there remain to be established about 35 river and a few rainfall stations.

The highest and lowest water, mean stage, and monthly range at 228 river stations are given in Table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Professor.*

CLIMATE AND CROP SERVICE.

By Mr. JAMES BERRY, Chief of Climate and Crop Divison.

The following summaries relating to the general weather and crop conditions during September are furnished by the directors of the respective sections of the Climate and Crop Service of the Weather Bureau; they are based upon voluntary reports from meteorological observers and crop correspondents, of whom there are about 3000 and 14,000 respectively:

Alabama.—Some locally heavy rains, but generally dry, hot weather prevailed, except rather cool middle of month; light frost in Walker County on 16th. Cotton continued to deteriorate from rust and shedding during first two decades, some damage by bollworms and premature opening, greater portion open by close of month, when over one-half picked. Gathering of early corn progressed slowly, yield continuing very good. Minor crops fairly good, though all late crops injured by drought.—*F. P. Chaffee.*

Arizona.—The rainfall during September was generally less than normal, but crops did not suffer from lack of moisture. Temperatures were generally moderate, but the latter part of the month was rather cool, and light frosts occurred in northern districts. But little damage resulted, however, as crops were too far advanced. The month was generally favorable to agricultural interests, and crops did well. Grass was abundant on ranges, and it cured nicely as hay, promising plenty of winter feed. Stock was in fine condition.—*M. E. Blystone.*

Arkansas.—The temperature was excessive and the rainfall deficient; drought caused late crops to deteriorate. Cotton opened rapidly; picking general at close of month; top crop light. Good crop of early corn being gathered; late promised a poor crop owing to lack of moisture. Irish potatoes fair crop; sweet potatoes good crop. Less than usual acreage sown to fall grains, as ground was too dry to plow. Apples fair crop of medium quality.—*O. C. Burrows.*

California.—Temperature and rainfall records were both broken during the month. At San Francisco the maximum temperature on the 8th, 101°, was the highest ever recorded for any month. The rainfall at San Francisco from the 22d to 26th, 5.07 inches, was 4.80 inches above the average for thirty-three years, and it was equally heavy throughout the central and northern sections, with abnormally heavy downpours in portions of southern California. Thunderstorms were more severe and frequent than usual in all parts of the State. Heavy snow fell in the high Sierra. Grapes, beans, grain in sacks, and unprotected hay were quite seriously damaged by rain.—*Alexander G. McAdie.*

Colorado.—Month favorable; fore part too dry for plowing and sowing, but drought relieved during last decade. Grain harvest, haying, and fodder cutting finished; thrashing under way; beet pulling and potato digging begun. Corn somewhat damaged by frost on 13th and 14th, but by close of month generally out of danger of further damage. Range cured well, but was considerably damaged by heavy rains during closing days. Fine crops of fruit and melons marketed.—*F. H. Brandenburg.*

Florida.—Cotton picking was generally favored by the lack of rain and at the close of the month cotton was about three-fourths harvested; on account of the ravages of caterpillars and other insects the yield was considerably below the average. Corn was mainly housed with fairly satisfactory yields. Cane did well and cutting had commenced in some localities. Citrus fruits had begun to color in the central districts, and marketing had begun south. Fruit trees looked well, but gardens showed lack of rain.—*R. T. Lindley.*

Georgia.—An unusually warm and dry September. During the first half cotton was damaged by rust, shedding, and caterpillars, top crop a failure; bolls opened fast, many prematurely; picking progressed rapidly, staple generally marketed as fast as ginned; labor scarce; yield above average; crop about all gathered in southern section, with rapid advance elsewhere. All minor crops seriously injured by drought. Corn crop being housed, yield good. Large crops of fodder and hay saved. Very little fall plowing.—*J. B. Marbury.*

Idaho.—The first two decades of the month were clear, warm, and dry; during the last ten days there was an increase in cloudiness and wind movement and occasional light showers. Weather was very favorable for the harvesting of all crops. Packing and shipping of prunes was nearly complete by the end of the month. Ranges became very dry, but stock was generally in good condition. Shipping of cattle and sheep was active during the month.—*Arthur W. Garrett.*

Illinois.—Fall plowing was actively prosecuted during the first decade and some seeding was done. Corn was generally reported to be late. Light frosts formed on the 15th, but no material damage ensued. Reports received during the second decade indicated a more favorable outlook for apples in the northern half. At the end of the month a considerable proportion of the corn crop was safe from frost in the southern half, and it was reported that the bulk of the crop in all sections would be safe by October 10.—*Wm. G. Burns.*

Indiana.—Dry until the 12th, but sufficient moisture afterward. Corn was nearly all matured in the northern and southern sections, but in the central section about 10 per cent was yet in danger from frost; cutting and shocking began about the 15th. Plowing, wheat and rye seeding, cutting and housing tobacco, hulling clover, and digging potatoes were nearly completed, clover and potatoes yielded fair and tobacco generally poor. Apples were faulty and fell badly.—*A. V. Randall.*

Iowa.—With temperature about normal, and less than average rainfall, the conditions were generally favorable for ripening corn and other belated crops. The most serious drawback was the occurrence of light to heavy frosts on the 14th, 15th, and 21st, but damage to immature corn was light, being limited to lowlands and relatively small portion of area planted. The fine weather in the closing decade brought 90 per cent of the crop to maturity. As a whole the season was favorable.—*John R. Sage.*

Kansas.—Corn cutting continued. Late corn filled well, was nearly all hard, well matured, and out of danger from frost. Wheat sowing began first week, was well advanced the last week. The early sown wheat came up, showing a good stand. A large crop of fine prairie hay was put up. The fourth cutting of alfalfa began the last week. Apple picking began the last week, generally a good crop. Potato digging began. Pastures good.—*T. B. Jennings.*

Kentucky.—The rainfall was nearly normal, but as it was irregularly distributed, some localities suffered from drought while others had abundant rain. High temperatures were reported from 1st to 3d and from 24th to 30th, but moderate temperature prevailed at other times. Light frost occurred in many places on the 15th and 16th, but the damage was slight. The weather was generally favorable for maturing and harvesting crops, and at the end of the month nearly everything was secured except late fields of tobacco and corn. Sowing of wheat progressed well during the last week.—*H. B. Hersey.*

Louisiana.—Showers early in the month interfered with cotton picking and caused some seed to sprout in the bolls. Dry, warm weather later caused cotton to open rapidly and picking was pushed forward, although

labor was scarce in some localities. Sugar cane was very rank and needed cool weather to develop the sucrose content. Rice harvest was retarded by local rains, and some damage resulted, but the bulk of the crop was housed under favorable conditions. Corn gathering was well advanced. Hay making was about completed. Truck gardens suffered for rain.—*I. M. Cline.*

Maryland and Delaware.—The month was deficient in effective moisture, and the yields of nearly all late crops were considerably reduced in consequence. The severe storm on the 14th damaged outstanding crops and shipping. Heavy to killing frost on the 22d injured some late corn, tobacco, and vegetables. The month was excellent for curing tobacco. During the last half corn cutting and fall seeding made rapid progress, the soil being in splendid condition.—*Oliver L. Fassig.*

Michigan.—Most of September, especially the nights, was too cool for the best maturity of corn and beans, which ripened slowly and unevenly, but most of the crops were safe before the heavy and killing frosts that occurred during the last decade. Wheat and rye seeding advanced rapidly during the latter half of the month and germination was splendid. The yield of apples and grapes was good and sugar beets were very promising. Late potatoes were fairly well matured.—*C. F. Schneider.*

Minnesota.—Much flax and latest wheat, oats, and barley were cut early in month. Thrashing progressed well when grain was dry enough. Cutting late clover for hay, plowing, and potato digging went on during most of the month. Frost on the 20th, 21st, and 22d killed most vegetation in north half, but in south very little injury by frost at close of month. Corn cutting began early and continued throughout the month.—*T. S. Outram.*

Mississippi.—The dry weather over the north-central and western counties caused cotton to open prematurely; heavy rains on the 23d damaged open cotton in Scott, Newton, and Lauderdale counties; shedding and bollworms were also damaging to cotton in many localities; bolls opened rapidly and picking made fairly good progress, although labor was scarce. Where rains were sufficient minor crops did well, but fall crops were generally poor. The last decade of the month was unusually warm.—*W. S. Belden.*

Missouri.—Late corn matured slowly during the first half of the month, owing to cool nights; frost occurred on the 14th and 15th causing no damage. Favorable weather followed, and by the close of the month three-fourths of the entire corn crop was safe from damage by killing frost. Wheat seeding made excellent progress, coming to good stand and fields showing green. Cotton picking began about the 20th, and potato digging about the third week. A good hay crop was secured.—*George Reeder.*

Montana.—The temperature was generally favorable for crops not yet matured, and there was no material damage by frost except to potatoes in places. Rain was needed in nearly all sections; range feed very short as a rule. Cutting of second and third crops of alfalfa in progress throughout the month. Wheat and oat harvests completed during the third week and thrashing by the close of the month. Potatoes were a fair crop. Apples matured and were of excellent quality.—*R. F. Young.*

Nebraska.—September was almost exactly a normal month as far as temperature and rainfall were concerned. Corn matured well and without injury by frost, the crop as a whole being a very good one. Haying in some late fields was completed, and the third crop of alfalfa was secured in good condition. A considerable acreage of winter wheat was sown under favorable conditions, while early sown wheat came up quickly and made excellent growth.—*G. A. Loveland.*

Nevada.—Generally fair weather prevailed over the State during the month, with about normal temperature and light precipitation. Conditions were favorable for maturing late crops, harvesting grain, and baling hay. No damaging frost occurred. Range feed was fairly good and live stock did well.—*J. H. Smith.*

New England.—The storm of the 14–15th was heavy and very general, giving at many stations over half of the monthly precipitation and causing winds of hurricane force on the southern New England coast. The killing frosts and freeze of the 22d and 23d were unusually early. Excepting the storm and frosts mentioned, the weather was characteristic of the season and very favorable for maturing and securing crops and for fall plowing and seeding.—*J. W. Smith.*

New Jersey.—The month was favorable for all farming operations; late maturing crops suffered materially from drought during the first half. Heavy rains, 14–15th, accompanied by high winds, were very destructive to standing crops; fruit blown from the trees and newly seeded fields and side hills badly washed. First killing frost, morning of 22d, did great damage to late corn and vine truck. At close of month seeding of wheat was not completed in southern section.—*Edward W. McGann.*

New Mexico.—Crops were generally secured before frosts, except in mountain districts of the north, where late planted vegetables and maturing grains were damaged. The prospects for winter feed were considered good. Stock was in very fair condition at close of the month. Heavy rains during the last four days of the month caused extensive and destructive floods, washed away bridges and railroad tracks, carried away houses and crops in valleys and lowlands, and caused some loss of life.—*J. B. Sloan.*

New York.—The weather during September was mostly favorable for farm work and the maturing of crops until the 22d, when killing frosts occurred, which considerably damaged buckwheat and corn, and apples in places. Light frosts had occurred on several previous dates. Seeding wheat and rye was finished and many fields were beautifully green. High winds in eastern New York on the 14th greatly damaged corn and apples, and disastrous gales on the 30th caused at least a third of the apples to drop.—*R. G. Allen.*

North Carolina.—The weather was generally quite favorable for harvesting crops. A severe storm on the 14th and 15th caused some damage by heavy rains and high winds in the central portion of the State. Cotton opened quite rapidly and picking became general about the middle of the month; the crop was reduced below the average by continual shedding. The curing of tobacco was completed, with good results as to quality, but with a small yield. Corn matured well. Minor crops, forage, and hay yielded well.—*C. F. von Herrmann.*

North Dakota.—The weather during the fore part of the month was unfavorable for farm work, as rain prevailed in all sections, with low temperature both day and night. Clear, warm weather followed, when it turned cold again, with a killing frost in the Missouri Valley, destroying all unmatured crops. Rain prevailed again in the eastern portion, followed after the 25th by a killing frost in all parts of the State, destroying all vegetation, but there was little damage, as all crops, except some late flax and corn, had matured.—*F. J. Rupert.*

Ohio.—The rainfall was deficient, especially over the southern portion. Wheat was far below the average in most places. Buckwheat good yield. Corn not damaged by frost, except in the northeast, but the yield was generally below normal. Pastures short. Clover seed poor yield. Considerable progress made in seeding of winter wheat. Tobacco good crop and nearly all housed. Potatoes good in quantity and quality. Grapes and pears good; peaches fair; apples fair to good.—*J. Warren Smith.*

Oklahoma.—The month was warm, with nearly normal precipitation; light frosts occurred over the Cherokee Nation on the 15th, causing no damage; fall plowing and wheat seeding well advanced over Oklahoma, but greatly retarded over the Indian Territory by hard ground; cotton picking progressed with poor to good yields; broom corn, kafir corn, cane, hay, and all forage crops were secured with good yields; pasturage continued in fair condition, but some stock were being fed.—*C. M. Strong.*

Oregon.—The month was dry and smoky, and vegetation suffered greatly for want of rain. Light showers fell during the last week, but beyond clearing the atmosphere of smoke and somewhat reviving pastures and gardens they were of little benefit. Some seeding was done in the western section by disking in grain on land plowed last spring. No plowing to speak of was accomplished. Hop picking was completed without interruption; the yield was below average.—*A. B. Wollaber.*

Pennsylvania.—Temperature and rainfall seasonable, but drought conditions prevailed in many districts during last decade. A large acreage of late corn, tobacco, buckwheat, garden truck, and fruit on lowlands was ruined by frost on 22d and 23d. At close of month plowing, seeding, harvesting, and thrashing were practically completed, but complaints were numerous that late sown grain had failed to germinate and meadows and pastures were failing rapidly in drought districts.—*T. F. Townsend.*

Porto Rico.—Heavy showers early in the month relieved the drought and favorable weather followed. At the close of the month all crops were in good condition. Coffee picking continued; the yield was light, but quality of the berry good. Many small plots of cotton were picked. Small crops, such as rice, corn, and beans, were harvested. The preparation of land and the planting of cane for gran cultura progressed as fast as practicable. Some tobacco was sown. Fruits and small crops were generally plentiful.—*E. C. Thompson.*

South Carolina.—Temperature variable, averaging about normal. Precipitation was excessive in the northeastern group of counties, and deficient in other parts of the State, where drought became severe and the ground too dry for fall plowing and seeding. Weather favorable for haying, rice harvest, and picking cotton, the bulk of which opened and was picked in the eastern and central counties and less than half in the western. It was too hot and dry for fall truck, late corn, peas, and root crops.—*J. W. Bauer.*

South Dakota.—Dry weather retarded plowing, but conditions were generally favorable for field work and for maturing late crops. Frost on 14th and 21st, however, probably rendered one-fifth of the corn crop unmerchantable. The month closed with thrashing and potato harvest satisfactorily advanced, corn cutting progressing favorably, millet harvest and haying finished, flax harvest practically completed, and probably one-tenth of the late corn in the lower Sioux River Valley exposed to injury from frost.—*S. W. Glenn.*

Tennessee.—Lack of sufficient moisture caused growing crops to make but little progress and delayed plowing. The conditions were favorable for saving hay and the ripening of early corn. Late corn was greatly damaged by the drought. Cotton opened rapidly, and was generally about one-half gathered by the end of the month. A good tobacco crop was housed. Fall apples were inferior.—*H. C. Bate.*

Texas.—Generally favorable weather conditions prevailed over the section during the entire month. The cotton crop was not materially affected one way or the other by the rainfall of the month; there was some fruiting but this was completely destroyed by insect pests, leaving no prospect whatever of a top crop; the bolls opened very rapidly and

SUMMARY OF TEMPERATURE AND PRECIPITATION BY SECTIONS, SEPTEMBER, 1904.

In the following table are given, for the various sections of the Climate and Crop Service of the Weather Bureau, the average temperature and rainfall, the stations reporting the highest and lowest temperatures with dates of occurrence, the stations reporting greatest and least monthly precipitation, and other data, as indicated by the several headings.

The mean temperatures for each section, the highest and lowest temperatures, the average precipitation, and the greatest and least monthly amounts are found by using all trustworthy records available.

The mean departures from normal temperature and precipitation are based only on records from stations that have ten or more years of observation. Of course the number of such records is smaller than the total number of stations.

Section.	Temperature—in degrees Fahrenheit.								Precipitation—in inches and hundredths.					
	Section average.	Departure from the normal.	Monthly extremes.						Section average.	Departure from the normal.	Greatest monthly.		Least monthly.	
			Station.	Highest.	Date.	Station.	Lowest.	Date.			Station.	Amount.	Station.	Amount.
Alabama	76.8	+ 2.5	Newbern	104	29	Ashville, Hamilton. Valley Head	40 40	16 16	1.36	−1.52	Daphne	5.11	3 stations	0.00
Arizona	73.2	− 1.5	Aztec Parker	112 112	3 6	Flagstaff	26	28	0.63	−0.51	Pinal Ranch	2.39	5 stations	0.00
Arkansas	75.4	+ 2.1	Heber, Warren	101	10	Oregon	37	15	2.46	−0.77	Russellville	6.18	Blanchard	0.16
California	70.3	+ 1.6	Elmdale Healdsburg	113 113	8 7	Bodie	15	19	2.66	+2.29	Pine Crest	10.95	15 stations	0.00
Colorado	57.4	+ 0.2	Wray	97	8	Lost Canyon	18	3	2.03	+1.01	Trinidad	6.78	Delta	0.33
Florida	79.4	+ 0.4	Molino Marianna Clermont	102 102 102	29, 30 30 6	Inverness	50	1, 10, 11	4.36	−2.59	Jupiter	8.92	Pensacola	0.29
Georgia	76.0	+ 1.7	Lumpkin	104	30	Diamond	44	16, 24	1.48	−2.12	St. Marys	9.55	3 stations	T.
Idaho	59.1	......	Blue Lakes	101	8	Chesterfield	21	14	0.37	......	Oakley	0.90	Vernon	T.
Illinois	67.1	+ 0.4	Equality	99	11	Lanark	32	15	5.10	+1.78	McLeansboro	10.11	Cairo	1.91
Indiana	67.1	+ 0.3	Rome	99	1, 7	Bluffton	32	22	3.44	+0.63	Washington	6.02	Moores Hill	2.01
Iowa	64.0	+ 0.4	Wilton Junction	94	11	Atlantic Earlham, Hanlontown. Rock Rapids	30 30 30	14 15 21	2.78	−0.52	Keokuk	8.33	Ida Grove	0.09
Kansas	70.2	+ 1.6	Ellsworth, Gove Medicine Lodge	103 103	9 9, 24	Achilles	25	14	2.60	0.00	Englewood	5.39	Pleasanton	0.64
Kentucky	71.1	+ 1.1	Beaverdam	99	1	Berea Loretto	34 34	15 16	2.58	−0.27	Fords Ferry	7.65	Beattyville	0.30
Louisiana	79.5	+ 2.5	Monroe	103	30	Farmersville	49	16	3.59	−0.01	Donaldsonville	7.25	Minden	0.15
Maryland and Delaware	67.1	0.0	Boettcherville, Md.	99	3	Grantsville, Md.	27	22	3.61	−0.04	Annapolis, Md.	6.22	Grantsville, Md.	1.05
Michigan	59.2	− 0.8	Plymouth	91	11	Roscommon	18	22	3.68	+0.56	Mackinac Island	9.15	Ludington	1.16
Minnesota	57.4	− 1.0	Beardsley	98	9	Pokegama Falls	15	21	3.14	+0.11	Caledonia	7.91	Luverne	0.49
Mississippi	77.6	+ 2.7	4 stations	101	10, 11, 29	Ripley	39	16	1.51	−1.11	Meridian	6.53	2 stations	0.00
Missouri	69.6	+ 1.2	Caruthersville	96	11	Bethany, Seymour	34	15	3.85	+0.22	Booneville	9.72	Sarcoxie	0.53
Montana	56.4	+ 1.6	Decker	102	9	Chester	15	19, 25	0.27	−0.84	Lamedeer	1.42	5 stations	0.00
Nebraska	63.6	− 0.2	Lynch	105	9	Agate	15	14	1.98	−0.02	York	5.72	Central City	0.35
Nevada	60.4	− 0.7	Battle Mountain	103	8	Wabuska	19	28	0.93	−0.79	Austin	3.03	Ely	0.02
New England*	57.9	− 2.8	Woodstock, Vt. Chestnut Hill, Mass. Norfolk, Mass	88 88 88	18 30 3	Grafton, N. H	18	23	5.31	−1.93	Patten, Me.	10.42	Nantucket, Mass.	0.78
New Jersey	64.8	− 1.2	Indian Mills	93	12	Charlotteburg	23	22, 23	4.79	+0.89	Freisburg	10.08	Tuckerton	0.89
New Mexico	64.4	0.0	Alamogordo, Carlsbad.	98	1	Luna	22	27	4.34	+2.37	Arabela	9.95	Fruitland	0.53
New York	59.1	− 1.0	Elmira	94	3	Paul Smiths	18	23	4.29	+1.08	Adams Center	8.24	Southampton	1.75
North Carolina	69.9	− 0.5	Lexington	99	30	Linville	31	16	3.26	−1.03	Pittsboro	7.81	Waynesville	0.39
North Dakota	54.7	− 2.3	3 stations	96	7, 10	Dickinson	18	14	1.65	+0.69	Wahpeton	6.44	Glenullin	T.
Ohio	65.5	0.0	Thurman	99	29	Orangeville	23	22	1.95	−0.76	Montpelier	4.47	Thurman	0.13
Oklahoma and Indian Territories.	74.9	+ 1.0	Waukomis, Okla.	106	9	Vinita, Webbers Falls, Ind. T.	38	15	2.55	+0.10	Healdton	6.23	Grand	0.24
Oregon	61.0	+ 2.7	McKenzie Bridge	100	3	Wallowa	24	19	0.75	−1.15	Bay City	2.71	Blalock	T.
Pennsylvania	63.7	+ 0.2	Irwin	95	29	Saegerstown, Smethport.	21	22	3.77	+0.14	Gordon	7.40	Lock No. 4	0.82
Porto Rico	78.3	......	Manati Central Aguirre	95 95	10 8	Adjuntas	57	23	9.28	......	Las Marias	19.24	Coamo	3.36
South Carolina	75.8	+ 0.2	Anderson	101	30	Greenville, Santuc.	44	24	2.46	−1.65	Smiths Mills	9.50	Little Mountain	T
South Dakota	61.0	− 0.1	Hotch City	110	9	Howell	21	21	1.06	−0.70	Ipswich	4.21	2 stations	0.00
Tennessee	72.3	+ 2.4	Pope	100	1, 11-13	Hohenwald	31	16	2.09	−0.98	Dyersburg	4.96	Bristol	T.
Texas	78.0	+ 1.4	Colorado	105	1	Texline	40	14	3.99	+0.89	Fort Clark	10.68	Brownwood	0.70
Utah	61.1	+ 0.6	Experiment Farm Rockville, St. George.	102 102	7 7	Coyoto Loa Woodruff	20 20 20	27 28 26, 28	0.40	−0.38	Modena	2.02	2 stations	T.
Virginia	68.4	− 0.7	Woodstock	96	3	Burkes Garden	28	16	2.32	−1.74	Wilkersons	5.07	Bristol	T.
Washington	60.2	+ 2.2	Trinidad	100	7	Northport	23	19	0.46	−1.54	Clearwater	3.07	7 stations	0.00
West Virginia	67.0	+ 0.8	Point Pleasant	95	29	Bayard	25	23	1.76	−0.98	Williamson	4.55	Lost Creek	0.43
Wisconsin	59.9	− 0.7	Prairie du Chien	92	28	Cranmoor (ex. sta.)	18	22	4.89	+1.58	Koepenick	9.20	Dodgeville	1.90
Wyoming	54.9	+ 1.1	Fort Laramie	104	8	South Pass City	10	14	0.46	−0.23	Moore	1.34	3 stations	0.00

* Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, and Connecticut.

picking was well advanced by the end of the month, being practically completed in the southwestern counties. Gathering of corn was delayed, owing to the great demand for labor in the cotton fields; early corn was good but late planting was badly damaged by the drought. Rice harvesting was interrupted by the rains, but good progress was generally made. Cane matured nicely and prospects were good for an average crop. Considerable grain was sown under favorable conditions. Gardens did well. Pastures and stock were in excellent condition. The hay crop was fine.—*W. H. Alexander*.

Utah.—Fine warm weather during the first two decades was followed by rains, colder weather, and killing frost. Crops were nearly all housed in good condition, except beets and potatoes, which were being housed. Sugar beets were above the average and sugar making was begun. Fall seeding was well advanced. Thrashing results from arid farms exceeded all expectations. Winter apples were abundant and of good quality. Alfalfa was above the average. Pasturage was good and stock were in good condition.—*R. J. Hyatt*.

Virginia.—The rainfall of the month was considerably less than the normal, and the temperature, also, was deficient. The tidewater section received ample rain for crop purposes, but in the central and mountain portions of the State conditions were more or less droughty. Little injury occurred to crops, however, as they were generally too far advanced to be materially affected by weather conditions. Harvest of late corn and tobacco was finished during the month. Fall seeding was delayed by the dry weather.—*Edward A. Evans*.

Washington.—The month was dry and warm, with considerable smokiness. The rain of the 8th laid the dust west of the Cascade Mountains, and none fell on the east side; the rain of the 22d was general over the State, with scattering showers to 28th, except in central part, where none fell. Wheat, oats, barley, and hay, were garnered in excellent condition. All crops were below the average. Fall seeding progressed. Potato crop light. Apples fine crop; pastures revived at end of month.—*William Bell*.

West Virginia.—Drought continued during the entire month, and seriously affected vegetation. Fall plowing progressed slowly, and considerable seeding remained to be done. Corn was not much damaged by

frost. At the close of the month corn was mostly in shock, and buckwheat was mostly harvested, with fair yields of both. Late corn dried up, and was mostly cut for fodder. Pastures were very short and water scarce, but stock were in fair condition. Winter apples were being picked with prospects of about a half crop.—*E. C. Vose.*

Wisconsin.—A general frost occurred at most points in the interior on the 15th, 21st, and 22d. Pasturage was excellent for the season throughout the month, and fall seeding of winter wheat and rye obtained an excellent start. The rains interfered to some extent with the digging of potatoes, but a large crop was secured without damage. Much corn failed to ripen and was cut for fodder. Apples were plentiful and of excellent quality.—*W. M. Wilson.*

Wyoming.—The month was favorable for the completion of haying and harvesting where that work was not completed during August. A good crop of grain was secured where the frosts of summer had not damaged the grain. Good range feed was general throughout the State, and stock were in excellent condition. The absence of any snow during the month over the greater portion of the State was very unusual for September.—*W. S. Palmer.*

SPECIAL ARTICLES.

A NEW THEORY OF FOG FORMATION.[1]

Translated by FRANK W. PROCTOR.

[Interpolations by the translator are in brackets.]

Of all the theories concerning the formation of fog, but two have been accepted up to recent times, one of which is now universally held. But it will appear that both are not in harmony with our observations [Aeronautical Observatory, Royal Meteorological Institute of Prussia], and with the latest physical investigations; and accordingly we must seek a new explanation.

*   *   *   *   *   *   *

The Davy-Dines theory [that condensation is due to the cooling of the earth's surface and its herbage by radiation] has been authoritative up to the present time, and is found in Hann's Lehrbuch der Meteorologie.

*   *   *   *   *   *   *

In order to show that this explanation does not satisfy the facts, exact moisture measurements in the neighborhood of the earth's surface are necessary. These were made in 1893 by Homén[2]; and it was shown by him that fog can not arise simply through the radiation of the ground. In view of the great importance of those investigations to the present study, let us look into the matter more closely. Homén observed that the dew-point fell at the earth's surface and in the lower air layers when dew began to form. It follows that as soon as the air at the earth's surface has cooled below the dew-point, the water vapor condenses out of the stratum immediately above the earth's surface on the cold underlying surface. Thereupon the vapor pressure diminishes considerably in the lowermost layer, and the vapor from the layers above comes to the earth's surface by diffusion, where it, also, is condensed. Thus there occurs a continuous progression of the water vapor from above downward.

Homén maintained that the downward diffusion at the bottom went on faster than the incoming of moisture from above, so that in spite of steady decrease of temperature, saturation could not occur.

The observations of Hamberg[3] and Rubenson[4] had before yielded a similar result. Hamberg found, for example, that at the beginning of the night, at six and six-tenths meters height above the earth's surface, the relative humidity rose from 70 to 90 per cent, and toward the end of the night from 95 to 98 per cent. From these observations Homén drew the above-mentioned conclusion. Nevertheless it would be conceivable that in cases where the drying goes on more slowly than the cooling, light fog might form.

On the answer to this last question, viz, whether the drying can proceed more slowly than the cooling, the decision in regard to the hitherto prevailing fog theory depends. Homén could have answered this through observation by means of his dew-point measurements[5] of August 12-13 and September 6-7, had he secured trustworthy synchronous temperatures. Then it would have appeared whether the cooling of the air, i. e., the conduction of heat, goes on faster than the diffusion of the water vapor. This question must therefore be answered in another way.

If we assume that at the height of one centimeter above the earth's surface, the air is saturated at $t_1°$ while at the earth's surface dew making begins at $t_0°$, then in the course of time vapor will diffuse from above downward, while simultaneously the higher temperature approaches the lower through conduction. For the sake of simplicity, let us assume that during the whole time the temperature of the earth's surface remains at $t_0°$. Thus it becomes warmed neither by condensation nor through the importation of heat from above, and is not cooled through radiation, which is the more admissible as the different influences will more or less offset each other. The upper layer will thus finally acquire the temperature $t_0°$ of the lower. Condensation will now begin in the upper layer if the vapor tension is at least equal to the vapor tension at $t_0°$, or if less than the difference of water content which can exist in the air at $t_1°$, and $t_0°$ is diffused in the same time that is needed for the difference of heat $t_1° - t_0°$ to pass by conduction through one centimeter.

A calculation of this kind, however, is not easily made. The same result is more conveniently reached if we calculate, on the one hand, the time required for the difference of water content of saturated air at $t_1°$ and $t_0°$ to diffuse through one centimeter, and, on the other hand, the time necessary to transmit a temperature difference of 1° one centimeter in the air.

It follows, then, that if the conduction of heat proceeds more rapidly than the diffusion of the water vapor fog formation can take place. In the opposite case, this is impossible.

The quantity, S, of a gas which in time Z passes by diffusion through a cross section, q, of a tube l centimeters long, when the density of the gas is d_0 at one end of the tube and d_1 at the other end, is, as is well known, expressed by the formula

$$S = kq\frac{d_1 - d_0}{l}Z,$$

or, when

$$d_1 - d_0 = d,$$

$$S = kq\frac{d}{l}Z, \qquad (1)$$

where k is the coefficient of diffusion, i. e., the amount of gas which is transmitted through cross section 1 when all the other quantities on the right-hand side of the equation = 1.

For the present case we assume $q = 1$, and according to the foregoing assumption $l = 1$; then it follows that

$$Z = \frac{S}{kd}.$$

S is the quantity of water vapor diffusing in one cubic centi meter of air.[6] This amounts, at a vapor pressure[7] of e_1, to

$$S_1 = 1.060\,\frac{e_1}{1 + at_1}\,10^{-6}.$$

[1] *Extract from* Die Entsthung und Auflösung des Nebels von Hermann Elias. Berlin, 1904. *Reprinted from* Ergebnisse der Arbeiten am Aeronautischen Observatorium, 1 Oktober, 1901, bis 31 Dezember, 1902.

[2] Homén. Bodenphysikalische und meteol. Beobacht, 1894, p. 171 ff.

[3] Hamberg. Om nattfrosterna, etc., 1874, p. 84 *and* La température et l'humidité de l'air à differentes hauteurs. Nova Akta R. S. S. Upsaliensis. 1879, Vol. X, No. 4.

[4] Rubenson. Om temperatur-och fuktihetsförhållandena, etc. Öfversigt af K. Sv. Vet. Akad. Förhandl. 1875, No. 1.

[5] Homén. A. a. O., pp. 174-175.

[6] S is here the quantity of water vapor whose time of diffusion through one centimeter of air is to be calculated. S_1 and S_0 are the total amounts of water vapor in one cubic centimeter of saturated air at temperatures t_1 and t_0, respectively.—*F. O. S.*

[7] Hann. Lehrbuch der Meteorologie, p. 219.

At vapor pressure e_0, $S_0 = 1.060 \frac{e_0}{1 + at_0} 10^{-6}$.

Whence, $S = S_1 - S_0 = 1.060 \left(\frac{e_1}{1 + at_1} - \frac{e_0}{1 + at_0}\right) 10^{-6}$.

The density d_1 is the weight of a cubic centimeter of water vapor at tension e_1 and temperature t_1, thus

$$d_1 = .0623 \times 1293 \frac{e_1}{760\,(1 + at_1)} 10^{-6} = 1.060 \frac{e_1}{1 + at_1} 10^{-6};$$

likewise, $d_0 = 1.060 \frac{e_0}{1 + at_0}$,

or $d = d_1 - d_0 = 1.060 \left(\frac{e_1}{1 + at_1} - \frac{e_0}{1 + at_0}\right) 10^{-6}$.

It appears, as was to be expected, that $d = S$. Then will

$$Z = \frac{1}{k},$$

and the coefficient of diffusion, according to Winklemann, is about 0.20; so we find that

$$Z = \frac{1}{0.20} = 5 \text{ seconds.}$$

Thus the time which the vapor of saturated air needs to reach the layer of air of lower temperature one centimeter distant is five seconds, regardless of the temperature.

The calculation of the time that is needed for the conduction of 1° [the temperature scale throughout is centigrade] of temperature along a track of one centimeter is simpler. The thermometric conductivity of air, that is to say the amount of heat which in one second traverses a cube with one centimeter sides, if we take as the unit of heat the quantity of heat necessary to raise the temperature of this substance 1°, is equal to .173;[8] therefore $Z = \frac{1}{0.173}$ seconds needed to allow the whole heat unit to pass through the cube or to conduct 1° from one surface to the opposite one. Therefore

$$Z = 5.78 \text{ sec.}$$

For any other temperature gradient the time of conduction will be inversely proportional to the gradient; hence

$$Z = \frac{5.78}{t_1 - t_0} \text{ sec.}$$

By comparing both times it is seen that the conduction of temperature is accomplished in the same time as the diffusion [of vapor] when

$$5 = \frac{5.78}{t_1 - t_0}, \text{ i. e., } t_1 - t_0 = \frac{5.78}{5.00} = 1.16.$$

Gradients of that strength are not found, the strongest observed by Juhlin[9] amounted to 2° in three centimeters, thus 0.67° centimeter, i. e., temperature equalization would have required 8.7 seconds; therefore much more than the time required for diffusion. We are therefore warranted in concluding that before the low temperature of the surface arrives at the upper stratum, assumed to be saturated at the outset, the upper layer has lost so much vapor that it is then reduced below the saturation point.[10]

The results for the two quantities would change in the same proportion if a thicker portion of air and thus a smaller gradient were taken. The time which the temperature uses increases exactly as the distance; so, also, does the diffusion period, as is seen by formula (1) in which Z appears in the numerator and l in the denominator.

In the foregoing calculation no account is made of the inflowing of vapor from above. This will modify the conclusion with regard to the time of diffusion. Whether this time can not be greater than the time of temperature conduction should not be passed over without further comment. It is seen by the calculation that the velocity of movement of water vapor in saturated air is only 0.2 centimeter = 0.002 meters per second, thus considerably smaller than any even feeble air movement, so that the distribution of water vapor in the vicinity of the earth's surface is not determined by Dalton's law, but by the kind and velocity of air movement. Therefore the objection that the inflow of vapor from above makes the diffusion period greater than the time of temperature conduction becomes of little force.

But if Dalton's law be assumed as admissible near the surface of the earth, fog can exist purely through the agency of radiation only when the temperature gradient reaches enormous values.[11]

This last assertion is supported by the fact that it is never found that fog at first forms directly on the earth's surface and grows from below upward, and by the further circumstance that in the example of double windows where the conditions are precisely similar to those in fog formation at the earth's surface (because the outer window is much cooled opposite the inner air), a clouding of the air is never observed, but at once a condensation of the vapor on the outer window. Also in our many ascents at which great temperature inversions with frost and dew were found, and thus saturation occurring at the earth's surface, nevertheless fog has not been observed.

The first beginning of fog formation has unfortunately been observed but once, though the ascents generally occurred in the early evening and morning hours; viz, when on October 27, 1901, fog was seen rising here and there in places, to which other causes contributed that will be discussed later; on the contrary December 17, 1901, furnishes so typical a case that the conclusion may be generalized at once. While about 3 p. m., without clouds, haze was noticed on the horizon, about 5:30 p. m. fog formed, not as if surface fog slowly extended itself upward, but as if the air up to greater heights, probably to over 50 meters, began to be turbid. The turbidity increased and toward the end of the ascent, with moderate fog, the characteristic billows (Wogen) of fog droplets could be plainly perceived. I had abundant opportunity also in the fall of 1902 to observe this kind of fog formation.

The vertical distribution of temperature and moisture at the ascent and descent, consequently before the beginning of fog formation and in the first stage of fog, have already been described and show nothing surprising. [They were for the ascent: temperature inversion from the earth to 100 meters, then temperature decrease to 175 meters, then a second increase to 250 meters, and thence upward the final decrease. On the descent the second inversion had disappeared, leaving a single inversion to 125 meters, and above a fall slightly less than the adiabatic rate. During both ascent and descent the relative humidity was constant from the earth to 500 meters, and the absolute humidity increased slowly up to 200 meters, and then decreased].

Otherwise the sudden setting in of a [pronounced] wind maximum at 100 meters which was theretofore feebly indicated at 200 meters height, is very noteworthy. The other meteorological elements from 3:30 to 6:30 p. m. had changed hardly any (the temperature at the earth had fallen from —4.6° to —4.9°, and the humidity increased from 85 to 86 per cent, both with little fluctuation; the barometer to be sure was falling rapidly, and dropped from 755.1 millimeters at 3:16 p. m. to 753.8 millimeters at 6:25 p. m.), so it is easy to connect the

[8] Hann. Lehrbuch der Meteorolgie, p. 10.

[9] Juhlin. Sur la temp. nocturne de l'air à diff. haut. Soc. R. de Sciences d'Upsal. 1889, und Met. Zeitschr. XXV, 1890, p. 73.

[10] Apparently the author does not take into account the cooling of the upper stratum by radiation.—*F. O. S.*

[11] We can hardly consider this as proven, since the author has just refused to take into account the influence of inflowing vapor from above, on the ground that Dalton's law is not admissible.—*F. O. S.*

change of wind velocity with the formation of fog. Yet it seems difficult to determine whether the increased wind movement was the result or the cause of the fog formation. An attempt to explain the large increase of wind velocity [from four to nearly eight meters per second] by the vertical temperature distribution has already been made; though in that place it was expressly stated that a satisfactory explanation could not be given, but that the cause of the gradients which produced the wind is doubtful.

The following considerations lead to the hypothesis that the increased air movement is a consequence of fog formation.

If it be assumed that before fog formation the air was saturated with vapor, then the pressure will be composed of the pressure of dry air and that of the vapor. If a portion of the vapor be condensed, then the vapor pressure at that place will become smaller; consequently also the whole pressure of air, without its being necessary for the barometer at the earth's surface to fall, for the weight of the whole air column has not been diminished. Thus at the place where the condensation occurs there must be a vertical gradient in the pressure which becomes a very light horizontal one if at some distance there is little or no condensation of vapor. This could therefore lead to a local wind that would be a result of fog.

Though it points to the contrary that the wind had increased up to 650 meters, though not so much as below—the increase [above] amounted to five-tenths to one meter per second—and further that on the next morning a very brisk wind prevailed which from 380 meters up to the greatest height attained grew to nearly six meters per second. In certain squalls, however, and overhead it was stronger, so that a further letting out of the balloon appeared impracticable. We therefore shall have to do, not with a local wind which was caused by fog, but with a temporary increase of air movement which reached up to great heights, and, therefore, on the evening of the 17th could not be preceived in the upper strata, because at the time the balloon was there the air movement had not appeared, but later and somewhat suddenly arose, brought about by the proximity of a low which made itself noticeable by the fall of the barometer. There remains, therefore, only the last possibility; that the wind, as soon as it attained a decided strength, caused the formation of the fog. This conclusion, standing directly contrary to the view generally prevailing hitherto, according to which fog formation is promoted by calms and dissipated by strong winds, shall be further supported by some observations.

On the 4th of November, 1901, in the morning, only very thin fog prevailed at the ascent, so that the balloon was still visible at 770 meters length of cable. Toward the end of the flight the fog thickened so that the balloon was first seen again at a distance of 100 meters. From the ascent to the descent a pronounced increase of the wind of nearly two meters per second was registered. Unfortunately we have no observations of the previous evening, but the ascent of the morning of November 3 showed very small wind velocity up to 100 meters (all the time under one meter per second), and it should be concluded that during the course of the night of the 3d and 4th, perhaps also in the early morning hours, it had so increased that it caused a condensation of the vapor.

If, now, proof is already furnished that strong vertical differences of wind velocity always prevail near the earth's surface when fog forms, it can also be shown that in cases where all the other conditions combine to favor fog making only trifling fog occurs, simply in default of sufficient differences of wind strength.

November 2, 1901, affords a typical example. At two high kite-balloon ascensions on November 1, one of which reached 2200 meters, the existence of an under, moist, cold, but feebly-moving current could be observed, which reached up to about 800 meters. Above lay what we have heretofore considered as characteristic of fog-making conditions; a warm and dry stratum with relatively small temperature decrease and somewhat brisker movement. Toward sunset the temperature had fallen to 1.2° at two meters height, and at the earth's surface to 0.2°, so that the temperature increase up to 95 meters, where 6.8° was registered, amounted to 6.6°. The relative humidity was constant at about 80 per cent up to this height. The conditions thus seemed favorable for fog formation, only it was nearly calm at the earth's surface; but between 120-400 meters the wind velocity amounted to three meters per second. On the next morning, with the exception of surface fog on the wet meadows in the neighborhood of the observatory, no fog was present, though the air up to about 75 meters was saturated. It now appeared that in the course of the night the wind velocity had further decreased, though from 30 meters up to 73 meters an increase from nine-tenths to two and seven-tenths meters per second was registered; but the wind decreased rapidly above, and at 275 meters was only one and two-tenths meters per second. In spite of the very strong temperature increase from —3.7° at two meters to +4.9° at 125 meters, i. e., of 8.6° in only 123 meters, and in spite of the high relative humidity, no fog formed. The coming clouds in the early morning could not be obstructive to the formation of fog, for, according to the view now prevailing, the air at the earth's surface would cool so much through conduction and radiation that the dew-point would be reached. These were in no wise impeded. Hence follow on the one hand the inadequacy of the kind of explanation hitherto advanced, and on the other the validity of the thesis herein advanced; that in fog formation the wind is a very active, yea, determining factor. As a further, if not so convincing, example, the 27th of October, 1901, could be cited. With especially favorable conditions only very thin fog formed, in consequence of a deficiency of wind.

In what manner the wind influences the vertical temperature distribution in the neighborhood of the earth's surface can be learned by a comparison of the condition curves of November 1 and 2, 1901, with those that were obtained in stronger winds.

While the influences of the cooling at the earth's surface on the evening of November 1 at one and a quarter hours after sunset extended up to about 100 meters, and on the next morning reached only 170 meters, we find that on the day before, with a brisk wind, which at 100 meters amounted to six meters per second, the cooling of the earth's surface was already perceptible at sunset up to 140 meters, with the condition of nearly a zero vertical-temperature gradient, which two and a quarter hours after sunset becomes an increase with height. There is seen by comparison of both condition curves[12] the essential difference of the march of temperature with little and with much wind. In the first case the inversion sets in at once at the earth's surface and attains a large value, but extends to a small height; in the second, on the contrary, the cooling is found in proportionately shorter time extended to a greater height, though not so strong. On October 30, with a wind of about ten meters per second at about 100 meters height at one hour after sunset, the cooling already extended to 184 meters, where the normal conditions became established. On October 28, finally, the highest temperature was reached some two hours after sunset at 150 meters, whereas the wind velocity at this height amounted to about seven meters per second.

This rapid cooling of the upper strata when there is wind can be explained only by the raising of the cooled air at the earth's surface. We have seen, in a former section, that billows form at the upper surface of fog, and indeed in the lower, denser

[12] The figures which accompany the original text showing temperature, moisture, and wind velocity curves registered by the balloon and kite meteorographs are omitted.

medium as well as in the upper, thinner medium. Thereby the small particles of air derive not only vertical but horizontal motion. The same thing will happen whenever the wind pushes away the strongly cooled, lowest strata lying on the earth's surface, which have been hindered in their movement by friction. The cold air is lifted by sufficiently strong winds, and also assumes lateral movements and a kind of surging, which are favored by the unevenness and covering of the land, such as trees, houses, etc., and mixes itself with the warmer air and cools it. Only in this manner is it possible that the cooled air of the earth's surface arrives so quickly aloft. But when this air, which in general is near the saturation point, if not wholly saturated, comes in contact with the upper, warmer air-layers, and these also are relatively moist, then, as von Bezold has shown, there can be light condensation, which makes itself perceptible at first as a turbidity of the air, later as fog. The height to which moderate wind bears the air from the earth's surface appears, according to the tolerably harmonious observations of October 28, 30, and 31, 1901, to lie between 150 and 200 meters, and up to this height only would the first turbidity be able to reach. The diffusion of water vapor out of the upper into the lower strata can not go on so rapidly as the cold air is blown upward, although perhaps before the beginning of fog formation, in case dew forms, the layers next the earth dry out a good deal. The resulting mixture, however, does not depend upon the absolute water content of this layer, for if both air masses that are mixed together are near enough the saturation point, condensation occurs every time. Homén[13] has directly tested that kind of mixture of the dry air of the under layer with moister air from above, by measurements with the hygrometer. He found, for example, that at a height of about one and three-tenths meters the dew-point rose from 6° to 9° after a puff of wind. Here belong also the sudden increases of temperature in night radiations, which are readily seen by the thermograph, but whose explanation is difficult without the accompanying wind record. This kind of temperature increase is found at the surface of the earth with an accompanying rise of wind velocity, and the warming is due to the mixture of warm air coming from above with the cold air lying on the earth's surface. [To illustrate this, two tables of observations follow in the original, in which maximum temperatures are seen to coincide with increase of wind velocity.]

The first suggestion of the above-described explanation of fog was made by Köppen[14], if we have rightly understood his somewhat brief exposition. Berson[15] appears to have had a similar thought in mind, when, in the discussion of the before-mentioned balloon ascension of November 10, 1893, he traced the origin of the fog to the flowing away of the relatively warm and moist air over the earth's surface cooled by radiation; whereby he hints at the entirely characteristic feature of fog, as well as of billow formation at its upper limit which is easily recognized on an accompanying photograph, and of the causal relation therewith of sudden wind changes.

The following of the further stage of fog formation, after we have learned the origin, is not difficult. We saw earlier that from increase of temperature upward, in the further progress, zero gradients (Isothermie), and then decrease of temperature upward, develop. Equal temperature up to a certain height follows further mixing of the upper and lower layers, though it is necessary to that outcome that the cooling of the earth's surface go on more slowly than the air of the lower layers can be brought upward and come close under the corresponding warm air. This retarded temperature fall at the earth's surface follows from diminished radiation, which, as soon as a clouding of the air occurs, can no longer proceed at the same rate as with clear sky. If, on the other hand, further radiation is entirely stopped by the coming in of a covering veil, or after sunrise when it would be compensated by the influence of the sun, then with stronger fog formation the temperature must rise at the earth's surface. The ascent of the morning of April 11, 1901, shows in fact such a temperature rise, though it is difficult to discover how far this is to be ascribed to the undercoming warm air or to the radiation of the sun; at any rate the first-named influence is not excluded.

When the fog reaches such a thickness that it becomes a great hindrance to the radiation of dark heat from the earth, its upper surface will take up the rôle of the earth, and further cool itself through radiation to the clear sky. Then appear the condition curves, which in a former part of this essay are characterized by the phrase, "completed fog below, but developing further above."

Their distinctive features, to recapitulate them briefly, are: temperature decrease upward, slowly becoming a zero gradient and finally an increase upward; in the lowest part, vapor-air ratio (Mischungsverhältnis)[16] decreasing upward, which at the upper limit of the fog generally increases, with a coincident diminishing relative humidity and a slow increase of wind velocity in the upper fog strata. The upward temperature decrease in the lower portion, as heretofore indicated, is due to the fact that the upper fog layers are cooled faster than the earth's surface, whose radiation is impeded. If the gradient exceeds 1° per 100 meters lively vertical movement will begin in the fog, which will bring down the cold of the upper layers, and cause a further cooling of the air at the earth's surface, which will now progress in like manner as the temperature reduction of the upper limit, and, therefore, is only an indirect result of radiation. The fog droplets will be evaporated by descent from the higher layers and will raise the vapor pressure at the earth's surface, while in compensation the saturated air from the ground, rising above, will soon precipitate the water and lower the absolute humidity. Therefore, it follows that the density of the fog increases upward, and reaches its maximum at the upper limit; whence it provides an easy explanation of the noteworthy fact that the balloon, at first occasionally and then fully disappears in a fog when its height must have already passed that of the fog.[17]

For example, the balloon on November 4, 1901, was yet visible at 100 meters.

The distribution of temperature and moisture at that point would permit hardly 100 meters for the thickness of the fog layer.

Atmospheric conditions on November 4, 1901.

Height in meters.	Temperature, ° C.	Per cent of relative humidity.
8	−2.5	100
18	−2.5	95
99	0.5	88

On December 20, 1901, the balloon disappeared between 150 and 200 meters, while the minimum temperature lay at 171 meters. Also the wetting of the cable by water droplets first occurs in the higher layers. The lower portion was always dry when we had thick fog at the earth's surface. Thus, for

[13] Homén. A. a. O. S., 172.
[14] Köppen. Die Bildung von Bodennebeln, Met. Zeitschr. 1885. P. 30.
[15] Wiss. Luftf. II. P. 202.

[16] In the original tables and text, absolute humidity values are given as the amount, x, of vapor found in combination with one kilogram of dry air, i. e., in $(1 + x)$ kilogram of moist air. Von Bezold applied the term "Mischungsverhältnis" to such quantities. The literal English equivalent "combining ratio" seemed to be not so suggestive as "vapor-air ratio."—*Translator*.

[17] A maximum density at the upper surface of the fog would not alone seem to explain the transient disappearance of the balloon before the final disappearance. Perhaps the author intends that the reader shall associate with this cause the wave movement at the upper surface of the fog, or the varying density of the fog in a horizontal direction.—*Translator*.

example, on October 28, 1901, when 550 meters of cable were in the air, only the uppermost 200 meters were wet, and on November 4, out of 950 meters, only 600 meters. The zero vertical temperature gradient (Isothermie) in the upper part of the fog is the result of mixing with the part at the earth's surface when the fog has already reached a certain density. But if the temperature underneath the overlying strata falls, they will also cool more and more during the course of the night, and, indeed, not alone by conduction and radiation, but essentially by the mixing of air masses of different temperatures if different wind velocities bring it about, as the larger vapor-air ratio over the fog proves. The cooling thereby resulting will then also extend down from the upper height, and will proceed relatively fast. The evening ascent of December 20, 1901, furnishes an interesting illustration thereof, at which, while the balloon was at the same height, within a short time substantial temperature decrease over the fog was observed.

* * * * * * *

The thermograph curve lets this fall be seen very plainly. Whether, up to the 21st, the fog limit had risen can not be stated with certainty; but, on the other hand, a further fall of temperature over the fog up to the upper current is proved beyond doubt. In one case only is an increase of thickness of the fog layer during the night indicated with certainty, viz, from the 27th to the 28th of October, 1901, when the upper limit rose from 175 meters to about 250 meters.

This slow growth can not surprise one, for it has already been emphasized that the fog owes its birth to the air billows at the earth's surface which have been produced by wind differences, and likewise proceed up to the greater heights tolerably quickly. Naturally because of small wind "gradients" (if I may so express it, in analogy to temperature gradients) at the higher elevations, in contrast to the strong ones at the earth's surface, small billows only will occur at the upper fog surface. As already shown in a preceding chapter this appears not to exceed 70 meters height, and therefore energetic condensation thenceforth will hardly be able to proceed. In general the result of radiation during the night will manifest itself in an increasing density of the fog, and only a small increase of height.

This further formation of fog will probably go on at the top of the billows. On the one hand the temperature of the fog is there the lowest, and, at the same relative humidity, condensation through mixture proceeds first at the greatest temperature differences; on the other hand this mixing will be favored by the form of the wave crests. For we must picture to ourselves that a shooting over (Uberschlagen) of these crests occurs not only very frequently, but indeed constantly, because the density of the lower media shows very little difference from those flowing over them. The overshooting and the accompanying drifting out of the cold air into the warm has often been observed in balloon ascensions, namely, in the fog banners produced by the billow crests, which are borne along by the wind and are later evaporated. If now in this manner the upper layer attains a certain degree of moisture, then, with further temperature fall condensation will set in, and the upper surface of the fog be raised. It is obvious, however, that this can go on but slowly, for a portion of the fog is always evaporated again.

A limit is set to further fog formation, if all other conditions favor progress, as soon as the fog fills the whole lower layer, and its upper surface reaches the higher-lying, warm, and most important of all, dry air current. On the 21st of December, 1901, this appeared to be nearly the case; the slight inversion which showed itself above the cloud would soon vanish by further cooling. Whether this maximum of fog height was really reached can not be said, for by reason of the breaking away of the kite balloons on December 21, the observations unfortunately were interrupted for a time. Such a growth will be favored by a long night in which radiation can go on uninterruptedly. Probably, therefore, in higher latitudes, especially in the polar regions, fog will have a considerably greater thickness than with us.

* * * * * * *

The appearance of fog on October 27, 1901, offers an essentially different form. While generally fog appears in a place and grows gradually, this one in the rapidly coming darkness on the 27th of October, arose out of the west already complete in the form of a cloud bank, and on its arrival had already attained considerable density, which was especially curious, and for that reason was noted. The condensation was so energetic that the water ran down the cable in streams, and the range of sight at the earth was hardly 50 meters. The condition-curve of temperature has the typical form for fog at the beginning of its development, viz, a quick temperature fall close over the earth, but decreasing slowly farther up. The humidity curve shows saturation up to the fog limit, which lay at about 170 meters, and also a high value above, near 80 per cent. The air movement is brisk in the fog; over it, feeble. A continuous succession in height of the meteorological elements gives the full explanation of the sudden appearance of this fog, as the figs. 34-37 show. [Figures are omitted.] They disclose, up to the afternoon of the 27th, a relatively warmer, drier, and feebly-moving air current flowing over the observatory; toward 5 o'clock, there suddenly entered a cooling up to at least 700 meters, but probably still higher. Simultaneously, the relative humidity rose (the vapor-air ratio had been increasing continuously since morning), and the wind freshened. We have here to do with a complete weather change in the whole explored layer, for the nearly parallel course of the curves of humidity, vapor-air ratio, and wind velocity indicate the breaking in of a stream of entirely different composition.

The weather change which is identified with the cold, moist, and thereby actively-moved air current made itself perceptible near the earth's surface in the night of October 26-27. While, therefore, the air at the earth's surface was relatively dry, on the evening of the 26th the relative humidity came up to over 90 per cent, and the line of equal relative humidity rose gradually in the course of the night. Above, it was dry up to midday of the 27th. The march of temperature showed on the morning of the 27th, between 200 and 400 meters, a disturbance in the form of an isothermal layer which could be traced not alone to a cooling of the earth's surface during the night, and which still existed in the evening in the same manner. The constancy of the temperature at 200 and 500 meters is surprising. At 500 meters it was practically the same at midday and evening. At about 200 meters it had fallen only about 0.1°. At greater heights a gradual fall showed itself. In the dry layer, which was not only relatively but absolutely dry, as results from the mixing ratios, nearly complete calm prevailed; thereunder was feeble movement of a little more than two meters per second. The slow advance of the lower air current is noticeable in the gradually rising lines of equal relative humidity and wind velocity; and it needed only a slight fall of temperature to bring about condensation of the water vapor, for at 4 p. m. the dew-point at about 100 meters was only 6.5°, while the air temperature was 8°. About 5 p. m. the cold current approached with a wind velocity of 5 to 6 meters per second in full strength, and caused sudden fog formation, which moved on with the wind from west toward east. Thus the fog arrived at Landsburg, which lies about 120 kilometers almost due east from Berlin, about 11 p. m., i. e., it extended itself with a velocity of about five and one-half meters per second, which the registered wind velocity fully shows.

Especially noticeable here is the wedge-shaped figure of the

cold stream, which H. Helm Clayton has already mentioned, and which has since been often observed at the observatory.

The whole phenomenon had much resemblance, as well in its approach as also in the distribution of temperature and moisture, to the earlier mentioned inflowing fog stream from the Pacific Ocean through the Golden Gate, which has been several times observed and described by McAdie.[18]

* * * * * * *

The formation of fog on November 4, 1901, is a pure example of mixture as von Bezold has studied it. The entirely irregular march of temperature in the morning [cold below, warmer above all the forenoon] permits the conclusion that here two air currents of different temperatures flow one under the other, and this produces a noteworthy distribution of temperature. If this occurs in sufficient proximity to the condition of saturation, then condensation occurs. The fog formation began in the morning and, in spite of increased insolation, continued until evening, when the fog reached the imposing height of 340 meters. The irregular temperature march had now given way to a regular one, and overhead the condition curves showed no surprising differences from the others which in the fog had become those unusually giving rise to fog. The warm and absolutely moist, but relatively dry air column with tolerably active movement [over seven meters per second] flowed this time over the one with less vapor, and on midday of the 4th, as can be seen by the curves of wind velocity and relative humidity, made an energetic push downward whereby, through mixing with the underflowing current, condensation ensued. Thereby the vapor-air ratio naturally decreased, and thus there resulted in the fog a relatively smaller water content.

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It may be said by way of recapitulation that most of the fog over the north German lowlands results from the flowing away of a moist air current over the earth's surface, which has been cooled by radiation, in such a manner that the lower cold air layers are tossed up (geschleudert) by the accompanying formation of billows, which occurs in winds near the earth, and which, by the mixture of the upper and lower layers, precipitates the fluid water. More rarely fog proceeds from the mixture of two moist currents of different temperature.

THREE NOTABLE METEOROLOGICAL EXHIBITS AT THE WORLD'S FAIR.

By JAMES H. SPENCER, Observer, United States Weather Bureau.

THE UNITED STATES WEATHER BUREAU.

The United States Weather Bureau exhibit occupies about 1000 square feet of floor space in the west end of the Government Building. Fronting, as it does, upon the main aisle, the exhibit is one of the most conspicuous in the building.

Ten instruments are operated by storage batteries, and several of them are connected to two or more registers. The outside temperature is recorded indoors by a telethermograph; the rainfall by a pluviograph; and the rainfall, sunshine, and wind velocity and direction by a station meteorograph. In order to show the method of operation, duplicates of these three registers are also connected electrically on short circuit with instruments within the exhibit space. Among the other instruments displayed are a set of self-recording thermometers, sling and whirling psychrometers, river gages, thermograph, barograph, single and double magnet registers, photographic and thermometric sunshine recorders, electric pyrheliometer, seismograph, mercurial and aneroid barometers, and a kite meteorograph, anemometer, and nephoscope. These instruments have already been fully described in various Weather Bureau publications.

[18] McAdie. Fog Studies on Mount Tamalpais, Monthly Weather Review, 1900, Nos. 7 and 11; 1901, No. 2, *and* Proceedings of the Second Convention of Weather Bureau Officials, 1903, p. 31.

A full-size Weather Bureau kite, with instruments in position, is suspended from the ceiling and connected with a reel in the usual manner.

Forecast cards are printed daily on a Harris automatic press, which has a capacity of about 15,000 per hour. These cards, and also a typical weather map and other printed matter, are distributed to visitors.

A large relief map of the United States gives the distribution of annual precipitation throughout the country. Two sets of swinging frames each contain eighteen charts or photographs, showing the climatology of the United States, cloud forms, floods, instruments, and other instructive matter.

A model storm-warning tower is displayed, with lanterns and a special hoisting attachment in position. The full-size oil-burning and electric lanterns are also exhibited.

The feature that perhaps attracts the most attention is the glass weather map. The reports are telephoned from the downtown office as fast as received by telegraph, and by 10 o'clock each morning the state of weather, current temperature, direction of wind, and rainfall from 122 stations are charted in different colors; the isobars are drawn in white. The weather conditions in all sections of the country are thus strikingly shown.

THE GERMAN EXHIBIT.

The German meteorological exhibit may be found in room D, German section, of the Educational Building. A large amount of self-recording apparatus is displayed, but perhaps the exhibits of greatest interest are the kites, rubber balloons,

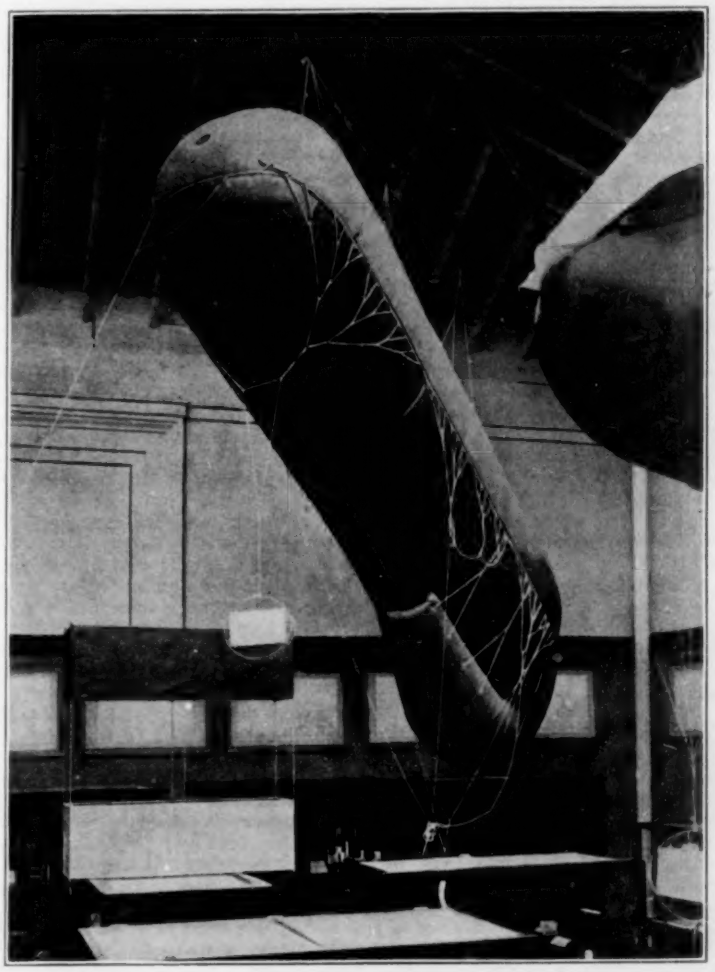

FIG. 1.—Rubber balloons.

kite balloons, and their accessories. The central figure in the accompanying photograph is the kite balloon, by the use of

which daily ascents have been made at Berlin since October, 1902, at the Aeronautical Observatory of the Royal Meteorological Institute of Prussia. The following description is taken from the German catalogue of scientific instruments:

* * * The volume of the kite balloon used in the Aeronautical Observatory is 68 cubic meters, and it is filled with hydrogen. The rear third of the cylindrical balloon, which is made of rubber-filled cotton stuff, is separated from the rest of the balloon by a ballonet, which is filled with air by the wind through an opening in its lower surface. A valve of cloth prevents the air from escaping. The pressure of the air thus forced in is communicated to the gas and gives the balloon a rigidity that enables it to act as a kite. Even in very stormy winds it is hardly ever forced below an angle of 30-35°. The steering sack, which is also automatically filled with air, and the tail, which is composed of wind funnels, serve to diminish side motions. * * *

One of the rubber balloons designed to carry self-recording apparatus to a height of 20,000 meters is shown in part at the right of the photograph.

Both of the balloons shown in the photograph are rigged for ascensions with the self-registering instruments in place. Note that the instruments of the rubber balloon are attached to the parachute (the white cover). The ordinary box kite is shown in the lower left-hand corner. The charts on the walls give data prepared from records obtained from balloon flights.

The following descriptions of balloons and apparatus are also taken from the catalogue of scientific instruments of the German educational exhibition:

Rubber balloons.—According to Assmann, for carrying registering apparatus to a height of 20,000 meters.

The balloons, of from 1200 to 2000 millimeters diameter, are made of Para-rubber; the weight is from 1365 to 3230 grams; the volume one to four cubic meters. They are filled with pure hydrogen and closed. A rubber balloon filled in this way and allowed to rise increases its volume until it bursts. This happens, in general, when its natural diameter is increased about two and one-half times, which corresponds to an increase in volume of fifteen and six-tenths times. The corresponding air pressure is 50 millimeters, which is attained at a height of about twenty kilometers. The apparatus falls unharmed to earth, supported by a parachute, which is spread above the balloon. These are made in bright colors that they may be more easily found.

For ascensions up to 8000 meters a light spring valve is inserted in the filling tube, and is opened automatically by means of a cord in the interior of the balloon when the balloon has expanded until its diameter is equal to the length of the cord. The gas escapes under the elastic pressure of the rubber only until the balloon has reached its natural diameter, and the balloon then sinks slowly to earth. Since the balloon does not burst a parachute is not necessary, and it can be used for four or five ascensions, as the rubber is not overstrained. The great advantage of the rubber balloon over others is that it never reaches a position of equilibrium in which the natural ventilation due to the vertical motion ceases so that the thermometer is affected by the solar radiation. The average velocity in ascending and descending is about five meters per second; thus an ascension of fifteen kilometers is finished in one hour and forty minutes. This prevents the balloon from falling at any great distance from the point of departure.

At times two balloons, filled to different degrees with gas, are connected in "tandem" so that after the bursting of the larger balloon the other serves to bring the apparatus down and is of use as a signal in its recovery. It also serves as a float if it falls in the water. Accompanying these advantages are the disadvantages that the descent is much slower, and consequently the apparatus may be carried a long distance horizontally and in windy weather injured by being dragged along the earth. It is also possible that *both* balloons may burst, in which case of course the apparatus is ruined.

Registering apparatus for kites, with new anemometer.—According to Assmann, designed in the workshop of the Aeronautical Observatory.

A vertical tube of polished aluminum, bent forward above against the wind, and backward below, contains a circular thermometer element, made by soldering a strip of Guillaume nickel steel (mark "Invar") to a similar strip of copper. The large difference in expansion of the two metals produces a considerable motion of the free end of the open ring. This motion is enlarged by a nickel steel lever and transmitted to a registering pen which is held by a silk thread stretched between two pulleys. In the same way the motions of a hair hygrometer, situated in the same tube, and of a set of three aneroids are recorded. A powerful clockwork draws the thinnest possible register-paper from a magazine-roller above and winds it on a roller below. The length of the paper is one and one-half meters. The registering pens stand one above another, so that almost the whole width of the paper is used. The coordinates of the curves are at right angles. The temperature is registered in red, the pressure in violet, and the moisture in green ink. A blotting roller prevents the blotting of the curves. At one edge of the paper ten minute time marks (1 min. = 1 mm.) are recorded, on the other edge the wind velocity is recorded, a mark being made after every 9800 revolutions of the Woltmann fan in the anemometer. This corresponds to three and twenty-one hundredths kilometers. The anemometer is situated in the upper part of the protecting tube. A magnalium case prevents the entrance of rain and serves to fasten the apparatus in the front part of the kite. The back wall is open to prevent wind resistance. The weight of the apparatus, which according to the length of the registering paper permits of ascensions of twenty-four hours or more, is 1200 grams.

Registering apparatus for rubber balloons.—According to Assmann, designed in the workshop of the Aeronautical Observatory.

The arrangement and transmission of the copper-Invar thermometer element, as well as the support of the recording pens on stretched silk threads, are the same as in apparatus No. 5. The motion of the registering paper is not produced by clockwork, but by the aneroids themselves on account of the change in the air pressure. The recording paper in the form of an endless rouleau is covered with lamp black, and is held stretched between two rollers. A third pen, driven by a light clockwork, draws a line across the whole width of the paper every two hours. Each of the three curves contains the air pressure as a second element. As it is important to differentiate the curves of ascent and descent, the recording pens are automatically lifted from the paper when the air pressure during the latter reaches 600 millimeters. This also prevents a blotting of the paper in landing and in the transportation of the apparatus. The funnel-like openings of the protecting tube above and below allow a free circulation of the air in ascending and descending. In this way the thermometer and hygrometer are protected from the influence of the rays of the sun. An ascension velocity of three or four meters per second is sufficient to prevent errors from radiation, and the velocity becomes greater than this as the balloon ascends. The time-pressure curve indicates the velocity of vertical motion, and if it is pointed at the greatest height indicates that the balloon has burst. In other cases there is a gradual change of direction. A light magnalium case, provided with a lock and protected against danger in landing by two wicker rings, serves as a protection against rain and careless handling by the finder. An envelope contains a despatch form and the information that a reward will be paid if the case is returned unopened.

The apparatus ready for use weighs 620 grams.

Triple balloon aspiration psychrometer.—According to Assmann, designed by R. Fuess, Steglitz.

The rapid changes of temperature and humidity during the vertical movements of the balloon make the observation of the psychrometer over any length of time unreliable on account of the difficulty of keeping the wet thermometer bulbs supplied with water. To obviate this difficulty, the balloon instrument is supplied with *two* wet-bulb thermometers which can be read alternately. For very low temperatures (under —20° C.), where the psychrometer becomes unreliable, a hair hygrometer, protected from radiation, is used. In order to prevent errors, a metal plate is placed over the scale of the thermometer last moistened. This plate serves also to reflect light on to the scale when it stands in shadow. The psychrometer, which is hung on a swinging arm at a distance of one and six-tenths meters from the edge of the car to protect it from temperature disturbances due to the observers, is read with a telescope.

REGISTERING APPARATUS FOR SCIENTIFIC INVESTIGATION OF THE UPPER ATMOSPHERE.

The following pieces of apparatus, designed in accordance with the plans of Professor Hergesell, in Strassburg, are remarkable for their great accuracy and sensitiveness as well as for their lightness. Their thermal capacity is so small that even when the temperature changes are very great they indicate the correct value within a few seconds.

Barothermograph for exploring balloons (ballons sondes).—This apparatus registers continuously the pressure and the temperature on the same drum. The thermometer is more than sufficiently ventilated and protected from radiation by the motion of the balloon itself. The driving mechanism is inclosed in a case for protection against cold. Weight, with protecting case, 630 grams. The apparatus can be raised by means of a rubber balloon of one and one-half meters in diameter to a height of 20,000 meters.

Barothermohygrograph for balloon ascensions.—The apparatus registers the air temperature, pressure, and moisture continuously on the same drum. By means of artificial ventilation and protection against radiation, the thermometer registers the correct temperature even in the strongest sunshine. The hygrometer is also artificially ventilated. The ventilation may be kept in action for several hours by means of a few galvanic cells or accumulators of small weight. Weight of the whole apparatus, one and six-tenths kilograms. The energy required for the production of artificial ventilation for a year costs only about 50 marks.

The instrument is also constructed without a barometer for use in meteorological stations.

Standard aspiration psychrometer.—According to Assmann. With arrangement for use in the Tropics.

Two mercury or alcohol thermometers with small cylindrical bulbs are each placed in two short, concentric, highly polished protecting tubes, thermally insulated from each other. These protect the thermometer

from radiation. A centrifugal aspirator, run by clockwork (25 turns per second) draws an air current of from two to three meters per second past the thermometers inside the protecting tubes. This removes the radiation heat that has not been reflected by the protecting tubes, so that even in the strongest sunshine (at great heights, on mountains, in balloons, as well as in the Tropics) the true air temperature is measured. One of the thermometer bulbs is wrapped in muslin and from time to time moistened with water. The vapor tension is calculated from Sprung's formula $f=f'-\frac{1}{2}(t-t')\,b/755$. For use in the Tropics, two extra springs and thermometers and a moistening apparatus are furnished.

Bolometric apparatus for the measurement of the total radiation.—In order to measure the radiation from a glowing body, which it sends out to its environment in the form of ether waves, a very sensitive instrument is required, which transforms the energy of the oncoming waves into heat, and by means of its rise in temperature allows this energy to be measured.

The bolometer, according to Lummer-Kurlbaum, consists of platinum foil 0.001 millimeter in thickness, covered with spongy platinum, in order that all wave lengths may be absorbed equally. The four arms of the bolometer are combined into a Wheatstone bridge. These are all as much alike as possible, in order that the balance of the bridge shall not be affected in any appreciable degree by the variations of the room temperature or the variations in strength of the measuring current. In consequence of this and on account of the small thermal inertia and extraordinary thinness of the strips, a radiation that produces a heating in the bolometer of only 0.00001° C. can be measured with an accuracy of a few per cent. In addition to the bolometer, the stand holds a blending apparatus and a shutter, provided with water cooling.

THE PHILIPPINE WEATHER BUREAU.

This exhibit occupies a building of its own. The map section is especially interesting and elaborate. An outdoor relief map of the Philippines occupies a space 110 feet long by 70 feet wide just back of the building. There are also eight smaller accessory relief maps of the islands, showing: (1) The average rainfall in the Archipelago and prevailing winds on the seas during February, the driest month of the year; (2) during August, the wettest month of the year; (3 and 4) the political and religious divisions; (5) the relative earthquake frequency; (6) mines and mineral springs; (7) forestry and agriculture; (8) ethnography. Other maps show Manila Bay; the Volcano and Lake Taal; Manila and surrounding towns; the distribution of rainfall in the Archipelago; typhoon tracks, etc.

A number of the Manila Observatory publications are displayed.

On each side of the building is a high tower. A Robinson anemometer is at the top of one and the transmitting portion of Richard's anemocinemograph is at the top of the other.

A microseismograph, built at the Manila Observatory, is shown in operation. This instrument is a copy of the grand microseismograph of Vicentini, with the vertical component modified by Rev. Father Algué. Twenty additional instruments are displayed, including Rev. Father Algué's refraction nephoscope, barocyclonemeter, and typhoon barometer. Rainfall, lightning, sunshine, earthquakes, temperature, atmospheric pressure, and the direction, velocity, and force of the wind are recorded by self-registering apparatus.

Both Father Fenyi's and Father Odenbach's ceraunographs, or lightning recorders, are also exhibited.

THE DIGNITY OF THE SERVICE.

Address by Mr. James H. Scarr, Observer, at the Weather Bureau Banquet, Peoria, Ill., September 22, 1904.

When I speak of "Dignity" I do not refer to that so-called dignity whose chief stock in trade consists of a silk hat and kid gloves. These and more are but the adjuncts of dignity, and in proper time and place possess a value not to be underestimated. But I would speak of that dignity which comes from a sense of responsibility for the performance of a duty—not only agreeable and satisfying, but imperative and valuable—the dignity that comes from a faith in the absolute integrity of purpose behind the work sought to be performed, and the exercise of every energy to bring that work to perfection.

Let me speak of the man as the visible sign of the Service, the stereoscope, if you please, through which the public views and forms its estimate of the Service.

The true dignity of the Service may be as high above the man charged with its duties as the heaven is high above the earth, but the public estimate of that duty will, for a long time to come, be measured by the public's opinion of the men who represent it.

The weather has so long been the synonym of uncertainty and fickle changeableness, that signs and portents (possibly of some value in the locality of their origin) have obtained a firm hold upon the public mind, so that it is not too much to assert that the service that seeks to reduce the weather changes to rule and foretell their occurrence by the application of known physical-laws, must, for a time at least, borrow its dignity from the men who represent it.

The man is wholly unworthy the work in which he is engaged, who fails to dignify that work with his very best effort. Not only must he so dignify his profession, but he must be deeply impressed with the fundamental truth that his best is good enough only so long as it is equal to the demand made upon him.

I know of no position in any community that demands more than that occupied by the representative of the United States Weather Bureau. It is only by the constant, faithful, and accurate response to these demands that the true dignity of the Service can be, and will be, established and maintained.

He must be a good citizen, sober, industrious, and moral; keeping carefully aloof from sectional or factional alliances or prejudices; resisting kindly but firmly every effort of local pride or rivalry to build up its particular climatological reputation by the suppression or garbling of conditions prevailing there or elsewhere. He must bear in mind that his principal duty to the community is the collection and dissemination of climatological and current weather data, in their special relation to the business of that particular community, and that the dissemination of such data must be timely, reliable, and impartial.

Neither must his dignity be always of the ministerial sort that invariably frowns upon the "Weather Joker." Let him have his joke so long as it contains no poison; it may afford an opportunity to point a lesson, strengthen a friendship, and advance the interests of the Service.

He must put the Service before self. In every public service the *man* becomes but the instrument of operation, and if found unsuited to the field in which he is employed, he must give way to another. It matters not, so far as procedure and results are concerned, whether the lack of adaptability be the fault of the instrument or of the field. It is much easier to change instruments than to reform fields.

He must be loyal. Put this down as fundamental. Nothing can exert such a disintegrating, demoralizing influence upon the Service as disloyalty. Assistants must be loyal to the officials in charge of the stations on which they serve. Observers and local forecasters must be loyal to the district forecaster. But above all be loyal to our honored Chief, than whom no man has done more to set up and maintain a high standard of dignity, and than whom no man could have done more to increase the efficiency and practical utility of the Service, while conserving, in so far as its hard exigencies permit, the personal interests of every man in it.

Remember, too, that the Service stands before the uninformed public, identified and measured by its failures. In the mind of that public the weather forecaster is not exempt from that stern but inexorably written law, "He that offendeth in one point is guilty of all." Let one serve his friend with devotion and singleness of purpose through the years of a long life, but never so unwittingly fail him in one instance, and the service of a lifetime is found wanting when weighed in his balance against the one failure.

Facing this fact, it is not hard to see two converging lines along which the Service must proceed to establish itself in the confidence of the public. The one is to make better forecasts. The other is to make clear to the public just what the Service attempts to do and does do in the matter of making forecasts. If forecasts for definite areas and times could be reduced to mathematical exactness, the Bureau could proceed with its work without seeking to take the public into its confidence. But this period is not now and may never be reached; and the work along this line may be termed interior. The exterior work is along the other line, and the two must be pushed simultaneously till they meet at the surface.

Personal work in the form of popular lectures and courses in educational institutions will accomplish much in this direction. But greater, wider, quicker, and surer is the influence of the public press. This is the medium which offers freely to bring the Service daily into confidential relations with every fireside; and I speak advisedly and with deliberation when I say that the men in charge of stations should be held strictly accountable not only for the articles bearing upon meteorological conditions and occurrences *appearing* in the papers in their vicinity, but for those which should but do not appear. To plead or prove inefficiency in this particular is to fail to meet an imperative demand of the Service, and to demonstrate an unfitness for that particular field.

These may seem to you, my comrades, to be hard lines, but from your respectful and sympathetic attention I feel confirmed in the opinion that you have not sought or remained in this service either because it is easy or largely remunerative, but because of a love for the Service and a devotion to duty, brightened and strengthened by that bond of brotherhood everywhere manifested; a bond developed by years of association, and a devotion that gives the strongest assurance that the dignity of this Service will be maintained by meeting every requirement and discharging every duty.

RECENT PAPERS BEARING ON METEOROLOGY.

Mr. H. H. KIMBALL, Librarian and Climatologist.

The subjoined titles have been selected from the contents of the periodicals and serials recently received in the Library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau. Unsigned articles are indicated by a ——.

Knowledge. London. New Series. Vol. 1.
—— A scheme for the comparison of climates. P. 243.
Scientific American Supplement. New York. Vol. 58.
Hopkins, N. Monroe. The construction of an indicating or recording tin plate aneroid barometer. Pp. 24040-24042.
Deslandres, H. General organization of solar research. Continuous registering of the variable elements of the sun. P. 24070.
Lendenfeld, R. von. Climate and glaciers. Pp. 24070-24072.
—— The mechanics of the atmosphere. Pp. 24072-24074.
American Journal of Science. New Haven. 4th Series. Vol. 18.
Hutchins, C. C. and Pearson, J. C. Air radiation. Pp. 277-286.
Symons's Meteorological Magazine. London. Vol. 39.
—— Meteorology at the British Association. Pp. 141-142.
Eliot, John. Meteorology at the British Association. Address to the sub-section cosmical physics. [Climate of India. Pp. 142-147.]
Shaw, W. N.; Dines, W. H.; Archibald, D.; Boys, C. V.; Buchan, A.; Glazebrook, R. T.; Mill, H. R. Investigation of the upper atmosphere by means of kites in co-operation with a committee of the Royal Meteorological Society. Pp. 147-148.
Bacon, John M. On upper currents and their relation to the hearing of far sound. Pp. 149-150.
—— The Dines recording barometer. Pp. 150-151.
Bonacina, L. C. W. The wettest spot in the United Kingdom. Pp. 152-153.
Pringle, C. S. Ball lightning. P. 153.
Russell, Spencer C. Ball lightning. P. 153.
MacGregor, W. Formation of a water spout. Pp. 153-154.
Nature. London. Vol. 70.
—— Relation of rainfall to run off. [Review of paper of George W. Rafter.] Pp. 299-300.
—— Sun-spot periodicity and terrestrial phenomena. [Abstract of work of O'Reilly.] P. 512.
Poynting, J. H. Radiation in the solar system. Pp. 512-515.
Lockyer, William J. S. Astronomy and cosmical physics at the British Association. Pp. 536-538.
Scottish Geographical Magazine. Edinburgh. Vol. 20.
Waite, Percival C. The annual rise and fall of the Nile. Pp. 543-544.
—— Scotia Bay meteorological and magnetical station. P. 552.
Bulletin of the American Geographical Society. New York. Vol. 36.
Ward, R. DeC. Sunshine and influenza. [Note.] P. 539.
Ward, R. DeC. Climatic influence on vineyards. [Note on article of Richard Strachan.] P. 540.
Ward, R. DeC. South African rainfall. [Review of article of J. R. Sutton.] P. 543.
W[ard], R. DeC. Transvaal meteorological service. [Note on article of R. T. A. Innes.] Pp. 543-544.
—— The coldest region of the earth. [Note.] Pp. 546-547.
W[ard], R. DeC. Antarctic meteorology. [Review of work R. C. Mossman.] P. 547.
American Inventor. New York. Vol. 20.
Nippoldt, A. On the investigation of simultaneous occurrences in the solar activity and terrestrial magnetism. Pp. 202-206.
Geographical Journal. London. Vol. 24.
Watson, E. R. On the ionization of air in vessels immersed in deep water. Pp. 437-441.
Maclagan-Wedderburn, E. Seiches observed in Loch Ness. Pp. 441-442.
H., A. J. The annual rainfall of the British Isles. [Review of paper of H. R. Mill.] Pp. 466-468.
Electrical World and Engineer. New York. Vol. 44.
—— The magnetism of the earth. [Note on paper of L. A. Bauer.] P. 638.
Geographical Teacher. London. Vol. 2.
Ward, R. DeC. The climatology of the United States: an outline. Pp. 212-218.
Terrestrial Magnetism and Atmospheric Electricity. Baltimore. Vol. 9.
Umow, N. Die Construction des geometrischen Bildes des gauss'schen Potentials, als Methode zur Erforschung der Gezetze des Erdmagnetismus. Pp. 105-112.
Bauer, L. A. The physical decomposition of the earth's permanent magnetic field. No. IV. Pp. 113-133.
Bemmelen, W. van. Magnetic survey of the Dutch East Indies. Pp. 135-136.
Moidrey, J. de. Note sur l'amplitude de l'oscillation diurne de la déclinaison magnétique et son inégalité annuelle. Pp. 137-139.
Cold Storage and Ice Trade Journal. New York. Vol. 28.
Wegemann, Karl. The use of hygrometrical instruments. Pp. 30-33.
Transactions of the Connecticut Academy of Arts and Sciences. New Haven. Vol. 11.
Verrill, Addison, E. The Bermuda Islands, their scenery, climate, productions, physiography, natural history, and geology; with sketches of their early history and the changes due to man. Pp. 17-956.
Science Abstracts. London. Vol. 7.
B[urbury], S. H Principles of aërodynamics and their application to some special problems. [Abstract of article of M. Smoluchowski-Smolan.] Pp. 639-640.
B[orns], H. Possible variation in the solar radiation and its probable effect on terrestrial temperature. [Abstract of article of S. P. Langley.] P. 640.
B[orns], H. Dimensions of deep-sea waves and their relation to meteorological and geographical conditions. [Abstract of article of V. Cornish.] Pp. 640-641.
B[orns], H. General circulation of the atmosphere in middle and higher latitudes. [Abstract of article of W. N. Shaw.] P. 641.
Annuaire de la Société Météorologique de France. Paris. 52me année.
Goutereau, Ch. Sur l'affaiblissement du rayonnement solaire en 1902-1903. Pp. 189-195.
—— Les époques d'apparition des premières glaces au Japon. [Review of work of Okada.] Pp. 203-204.
—— La télégraphie sans fil et la prévision du temps. [Note.] P. 204.
La Nature. Paris. 32me année.
—— La foudre en boule. P. 258.
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Libert, L. Le soleil vert. P. 294.
Jullien, Omer. Extraordinaire sécheresse dans la région française du Mont-Blanc. Pp. 298-299.

Comptes Rendus de l'Académie des Sciences. Paris. Tome 139.

Chauveau, A. B. Sur la déperdition de l'électricité dans l'air au voisinage de sources thermales. Pp. 531-533.

Pigeon, Léon. Sur un effet de vide produit par une trombe. Pp. 535-538.

La Géographie. Paris. Vol. 9.

Angot, A. Les observations météorologiques de la Mission saharienne Foureau-Lamy. Pp. 1-4.

Deniker, J. Voyage de M. Tsybikov à Lhassa et au Tibet. [Observations at Lhassa.] P. 25.

Laloy, L. Climat et flore du bassin méditerranéen. [Review of work of A. Philippson.] Pp. 31-35.

Bulletin de la Société Belge d'Astronomie. Bruxelles. 9me année.

—— Le variomètre. Pp. LIII-LIV.

V., J. Les variations du temps et les malades. Pp. LIV-LV.

Joule. Un thermomètre extrêmement sensible. P. LVI.

V., J. Température à l'ombre et température au soleil. Pp. LXI-LXII.

V., J. L'observation du brouillard. Pp. LXII-LXIV.

Ciel et Terre. Bruxelles. 25me année.

Rahir, E. Note sur une perturbation barométrique observée dans la caverne du "Höll-Loch" (Trou d'Enfer) à Moutathal (Suisse), ainsi que sur quelques constations thermométriques. Pp. 338-340.

—— La télégraphie sans fil et la prévision du temps. [Note.] Pp. 349-350.

—— Les fortes chaleurs de juillet 1904 en France. [Note on article of G. Barbé.] Pp. 350-352.

—— Effets du sirocco. [Note.] P. 352.

—— Le climat de Panama. [Review of article of Wm. H. Burr.] Pp. 373-374.

—— Courants aériens verticaux en temps d'orage. [Extract from article of Santos-Dumont.] Pp. 374-375.

Das Wetter. Berlin. 21 Jahrgang.

Hegyfoky, J. Die tägliche Drehung der Windrichtung. Pp. 193-199.

Nimführ, R. Ueber Wetterprognose. Pp. 199-202.

Hennig, R. Die Interessen der praktischen Witterungskunde an einem Islandkabel. Pp. 203-205.

Holdefleiss, P. Die Abhängigkeit der Ernteerträge von der Witterungsfaktoren. Pp. 205-211.

Assmann, Jul. Ein Gewitterregen von 84 Millimeter in 45 Minuten. Pp. 212-213.

Schwarz, L. Staubfall auf der Schneekoppe. 214-215.

Das Weltall. Berlin. 4 Jahrgang.

Krebs, Wilhelm. Kältpole und Eistriften der Antarktis in den Jahren 1902 bis 1903. Pp. 442-444.

Gockel, Albert. Radioaktive Emanationen in der Atmosphäre. Pp. 591-594.

Annalen der Physik. Leipzig. Vierte Folge. Band 15.

Bestelmeyer, A. and Valentiner, S. Ueber die Dichte des Stickstoffs und deren Abhängigkeit vom Druck bei der Temperatur der flüssigen Luft. Pp. 61-73.

Valentiner, Siegfried. Ueber die Abhängigkeit des Verhältnisses c_p/c_v der spezifischen Wärmen des Stickstoffs vom Druck bei der Temperatur der flüssigen Luft. Pp. 74-106.

Physikalische Zeitschrift. Leipzig. 5 Jahrgang.

Rebenstorff, H. Ein einfacher Apparat zur Untersuchung der Nebelbildung und über Anordnung der Nebelkerne bei der elektrischen Spitzenentladung. Pp. 571-574.

Gaea. Leipzig. 40 Jahrgang.

—— Versuche und Beobachtungen über Regentropfen. Pp. 650-656.

—— Kugelblitz auf See. P. 689.

—— Die Ursache des Donners. P. 690.

—— Internationale wissenschaftliche Luftfahrten. Pp. 690-691.

Geographische Zeitschrift. Leipzig. 10 Jahrgang.

Dove, K. Die geographische Eigenart des Aufstandgebietes in Südwest-Afrika. Pp. 507-513.

Wiener Luftschiffer Zeitung. Wien. 3 Jahrgang.

—— Internationale Kommission für wissenschaftliche Luftschiffahrt. Pp. 218-219.

Annalen der Hydrographie und Maritimen Meteorologie. Berlin. 32 Jahrgang.

Heyne, —. Die Witterung zu Tsingtau im März, April und Mai 1904, nebst einer Zusammenstellung für den Frühling 1904. (Bericht der Kaiserlichen Meteorologisch-astronomischen Station in Tsingtau.) Pp. 465-469.

Perlewitz, Paul. Drachenaufstiege in ihrem Einfluss auf Gewitter. Pp. 469-473.

Becke, von der. Das Sturmwarnungswesen in Italien. P. 483.

Herrmann, E. Haben zeitliche erdmagnetische Störungen Bedeutung für die Navigation? [Review of article of August Krogh.] Pp. 486-487.

Boletim da Sociedade de Geographia de Lisboa. Lisboa. 22 Série. 1904.

Berthoud, Paul. Météorologie de Lourenco Marques. Pp. 255-257.

Berthoud, Paul. Météorologie de Lourenco Marques. Pp. 294-296.

Himmel und Erde. Berlin. 16 Jahrgang.

Fremery de Breda, D. A. de. Een merkwaardige halo. Pp. 74-76.

—— Verband tusschen de weersgesteldheid aan den Oost-en den Westrand van der Atlantischen Oceaan. Pp. 76-77.

Monthly Consular Report. Washington. August, 1904.

Mason, Frank H. Serious drought in Germany. Pp. 58-59.

VORTEX RINGS AS REVOLVING SOLIDS.

By Dr. F. J. B. CORDEIRO, Surgeon U. S. Navy. Dated San Francisco, U. S. S. *Solace*, March 21, 1904.

It appears that my use of the smoke rings[1] as an illustration of the fact that a gas moving in a certain manner may become, for dynamical purposes, a solid was not satisfactory to the Editor. Permit me, therefore, to give another illustration, nay, a proof, that we may regard the cyclone as a revolving solid.

Suppose we coil a tube into a spiral, so as to imitate to any degree of approximation the flow of the currents of air in the cyclone, and suppose that, by means of flexible tubes, we permit a stream of water to enter at one end and leave at the other end of the spiral. If the water passes through with great velocity, and we turn the revolving mass in the direction of the arrow [i. e., so as to change the plane of the spiral], a gyroscopic force will be set up, normal to the plane of turning. Such an experiment can easily be carried out at any time. Now let us, instead of water, substitute a stream of air; the same gyroscopic forces will be set up, only proportionately less, as the mass of the air is less than that of the water. Now the rigid spiral tube and the flexible tubes have no part in the gyroscopic action, but are used only to cause the air to assume the motion it does in the cyclone. In a cyclone the centripetal forces take the place of the artificial constraints we have used in our experiments. Consequently, air currents rotating in such a manner must give rise to gyroscopic forces. Now a cyclone, though moving, preserves its shape and that of its air currents, although, as in our experiment, new air is being constantly taken in and thrown out. The amount of gyroscopic action will depend upon the mass of air in rotation and its velocity. Only the motion at right angles to the axis will be effective in this connection. The motion toward the axis will produce no gyroscopic effect. Now, for the purposes of our problem, we can substitute a solid gyroscope, producing an equivalent gyroscopic effect. This seems to me to be a rigid demonstration that the poleward acceleration of a cyclone is due simply to the gyroscopic forces generated, and I believe I am the first to have explained this phenomenon.

Now, as to Ferrel's work. This author certainly had an inkling that there were certain forces called into play setting cyclones poleward, but his demonstration mathematically of such forces was far from correct. His formula (52, quoted in the MONTHLY WEATHER REVIEW, 1903, p. 517), which gives for the accelerating force in the direction of the meridian

$$\frac{V}{M} = -\frac{g}{578}\frac{u \sin \phi}{n}\left(\frac{s'}{R}\right)^2,$$

is not correct. This does *not* express the acceleration northward (or southward).

I think there can be no doubt that Ferrel was not familiar with the analysis of motion of the gyroscope; and for that matter, few if any persons at that time (1857 and before) understood its motion. Professor Olmstead, late professor of natural philosophy and astronomy in Yale College, published a Natural Philosophy, I think as late as 1850, in which he refers to the gyroscope as the "mechanical paradox," and states that its motion is not understood. It was Major Barnard who gave the first clear exposition of its motion in this country. I believe, if my memory serves me right, that his book, Analysis of Rotary Motion as Applied to the Gyroscope, was written in 1859.

[1] *See* "The problem of the cyclone." Monthly Weather Review, August, 1903, p. 516.

In this book he refers to the numerous false notions that were at that time prevalent in regard to its motion. It would seem from his preface that all the explanations previously given as to how a gyroscope sustained itself against the action of gravity were incorrect. If Ferrel had understood the gyroscope, I believe he would undoubtedly have applied its analysis to the cyclone; but, failing this, his attempted demonstration that "if the fluid gyrates from right to left, the whole mass has a tendency to move toward the north," will not stand the test of examination.

As for note 5 on page 517, MONTHLY WEATHER REVIEW, 1903, I think this much can be said. The tension of the atmosphere is at all times due to the tension of the dry air plus the tension of the aqueous vapor, so that if at any time this latter tension is taken away by the condensation of the vapor into water, this must cause an inrushing of the winds to restore the equilibrium. The maintenance of the energy necessary to propel a cyclone can only be derived from the latent heat set free by precipitation, and if this constant supply of fresh energy be not forthcoming, the cyclone must soon stop on account of friction.

EXTRACT FROM THE EDITOR'S LETTER TO DOCTOR CORDEIRO.

Dated March 28, 1904.

It is a very ungracious task for an editor to publish his own notes in connection with an author's contribution to his journal. I believe that editors sometimes reject that which they do not agree with, or "edit" to suit their own ideas. In your case, I think that, as the mechanics of the atmosphere is so difficult and yet so important, I will publish a part of your letter of March 21, and invite public discussion on the subject. In general, the motions of the atmosphere can not be treated as the motions of a solid or group of solids, and nothing but the most rigorous hydrodynamics is of any real value to meteorology. Professor Ferrel's reasoning on the movements of a cyclone poleward is precisely like your own, so far as I can see. You say he was unfamiliar with the analysis of the gyroscope and that few, if any, understood the subject in 1857, and that Major Barnard was the first in this country to give a clear exposition of its motion in his memoir of 1859. I fear that you have forgotten a part of the history of our science. The gyroscope was perfectly foreshadowed by Poisson. Barnard simply put his ideas into convenient shape as a slight modification of the great problems of the top and the rotation of the earth on its axis, both of which had been discussed for a century before his time. The special case of Foucault's gyroscope was abundantly discussed in French scientific literature from 1848 to 1853, and the discussion was perfectly well known to Professor Ferrel. In fact, his very first published paper, in 1851, was a popular explanation of the gyroscope or rotascope, as it was called. His whole early life had been given to the study of the movements of bodies on the earth's surface, and it was only necessary for him to quote the equations and principles of analytical mechanics, as set forth in LaPlace's Mecanique Celeste. Major Barnard's explanation is excellent, but it is entirely wrong to say "that all the explanations previously given as to how a gyroscope sustains itself against the action of gravity were incorrect."

Your idea that "if the vapor tension in the atmosphere is diminished by the condensation of the vapor into water, this must cause an inrushing of the winds to restore the equilibrium" is as old as Hutton in England and his contemporaries in Germany; it was utterly demolished by Espy and has no place now in meterology.

Your idea that the "energy necessary to propel a cyclone can only be derived from the latent heat set free by precipitation" is that which Espy fought for all his life, and was adopted by Ferrel up to within a year of his death. Eventually, however, he saw that there is another source of energy even more important, and they both are combined in our storms. During the last fifteen years, our problem has been to get at the proper relation of these two sources of energy.

Thank you very much for your little book on hypsometry. I notice that in the preface of 1897 you state that this subject "has not been touched upon since 1851, when it was discussed by Guyot." Here, again, you ignore completely a very large and important literature.—*C. A.*

NOTES AND EXTRACTS.

METEOROLOGY IN ROUMANIA.

The last annual report of the Roumanian Meteorological Service[1] forms, as usual, a bulky folio of some 700 pages, with the text in both French and Roumanian, in parallel columns. The data for 1900 are given in considerable detail, and include for Bukharest, which alone is classed as a station of the first order, observations of ozone, evaporation, temperature of the unprotected thermometer at various heights above the ground, and temperature of the soil, but to a depth of only 120 centimeters. Observations at this station are given separately for each hour of every day for pressure, temperature, vapor pressure, relative humidity, wind direction and velocity, sunshine, solar radiation, and precipitation, with cloud observations hourly from 7 a. m. to 8 p. m. These figures are averaged for months, decades, and pentads, and the whole is recapitulated by months, seasons, years, lustrums, and decenniums, and for the whole period of observations, 1885–1900. Tridaily observations are published for 12 selected stations of the second order, with monthly and annual summaries for the entire 52 of this class, and this exhaustive collection of data is completed by the records of 340 rainfall stations.

A reduction in the station force delayed the publication of the volume until the fall of 1903. Observations are published for 1900 only, but the administration report includes in addition the two following years. There has been a steady increase in the number of stations, from 386 in 1899 to 401 in 1902, including 343 rainfall stations, and 58 regular stations, or one of the latter to each 849 square miles. While this ratio compares favorably with that in other countries, the necessity of obtaining unpaid observers has prevented the most advantageous distribution of the stations, and some important districts are almost without observations.

Dr. Stefan C. Hepites, the director of the institute, urges the establishment of a system of daily forecasts, which, he estimates, would require an increase in the annual budget of less than 20,000 francs.

[1] Analele Institutului Meteorologic al Romaniei, Tomul 16, 1900.

It is a little surprising to find that Roumania, with its agricultural interests and its favorable situation, from a meteorological standpoint, is still without this crowning feature of meteorological work.

The present volume of the Analele includes the following five memoirs:

1. La pluie en Roumanie en 1900. By St. C. Hepites.
2. Revue climatologique annuelle. Année 1900. St. C. Hepites.
3. Étude sur la crue du Jiu au mois d'Aout 1900. Em. de Martonne.
4. Observations magnetique faites à Bucuresci au cours de l'année 1900. I. St. Murat.
5. Registre des tremblements de terre en Roumanie. Année 1900. St. C. Hepites.

The precipitation over the entire kingdom averaged 662 millimeters, exceeding by more than 9 per cent the average of the preceding seventeen years, and was, as usual, most abundant in summer, when 213 millimeters fell. The distribution by altitude is shown in Table 1.

TABLE 1.

Altitude in meters.	Precipitation in millimeters.	Number of days with rain.
Below 100	591	82
100–200	665	87
200–500	698	91
Above 500	853	100

The most remarkable rainfall in Roumanian records, if intensity and amount are both considered, occurred on August 17, 1900, when 320 millimeters (12.6 inches) fell at Cara Omer between 8 p. m. and midnight, causing some damage at that and neighboring villages. Cara Omer is situated in the southeast, on the Dobrujan plateau, at an altitude of 150 meters.

The snowfall averaged 86 centimeters, amounting to 100 centimeters in the province of Moldova, where in March

drifts overarched the houses in many villages, and for several days interrupted travel.

Although 1900 was warmer than usual, the maximum temperatures have been lower than in other years. The highest temperature of the year was 37.5° C. at Giurgiu, and the lowest —30.0° at Pancesci-Dragomiresci. From the previous records, we find extremes of +42.8° C. at Giurgiu in 1896 and —35.6° C. at Striharet in 1893. The mean annual temperature at Bukharest for 1900, 11.2°, is 0.9° above the normal, and has been exceeded but four times during the last thirty years.

Table 2 gives data for Bukharest for 1900, and also for the entire period of observations, 1885–1900.

TABLE 2.—*Data for Bukharest for 1900, with entire period of observations, 1885–1900. Latitude 44° 25′ N.; longitude 26° 6′ E.; altitude, 74 meters.*

1900.	Temperature in degrees centigrade.							Mean relative humidity.
	Mean.			Extremes.		Daily range.		
	Month.	Max.	Min.	Max.	Min.	Greatest.	Least.	
January	— 2.5	0.5	— 5.0	9.5	—14.2	12.0	1.0	93
February	2.7	5.7	0.2	11.5	— 3.9	11.5	1.8	91
March	1.8	6.3	— 1.7	14.8	— 9.1	14.5	2.7	83
April	10.5	16.3	5.6	24.2	— 0.4	15.6	7.0	76
May	16.0	22.8	14.0	30.5	3.0	19.3	4.8	69
June	20.5	27.6	14.0	34.5	10.6	18.5	8.5	67
July	23.0	29.7	16.8	34.9	10.5	17.5	6.6	63
August	22.4	28.9	16.0	34.5	12.4	19.6	4.7	60
September	16.7	23.9	9.5	30.5	6.4	20.0	6.1	64
October	13.8	20.9	7.6	30.5	— 1.8	18.7	3.2	71
November	7.4	9.9	5.0	16.0	0.4	13.3	1.5	84
December	1.5	5.2	— 1.2	12.1	— 5.3	12.4	2.1	84
Year	11.2	16.2	6.4	34.9	—14.2	20.0	1.0	75
Period, 1885–1900	10.3	16.2	5.1	40.1	—30.5	....	....	73

1900.	Wind.		Precipitation.			Mean cloudiness.
	Mean velocity. Miles per hour.	Prevailing direction.	Total.	Max. in 24 hours.	Number of days with 0.1 millimeter.	
			mm.			
January	11.2	ene.	81.6	21.5	14	8.7
February	9.4	ene.	61.8	18.7	19	8.4
March	12.5	ene.	80.1	25.8	11	6.3
April	12.8	ene.	43.2	13.4	11	6.4
May	9.8	ene.	49.9	14.5	12	6.1
June	7.6	wsw.	97.1	51.4	13	5.0
July	7.2	wsw.	66.3	29.7	10	4.0
August	9.2	ene.	117.5	83.6	7	3.6
September	4.9	ene,	24.1	12.4	4	2.5
October	6.9	ene.	28.3	13.0	9	4.2
November	10.3	ene.	43.9	17.8	13	8.9
December	10.5	wsw.	39.3	18.1	6	6.2
Year	9.4	ene.	733 2	83.6	129	5.8
Period, 1885–1900	8.5	ene	604.8	....	....	5.2

F. O. S.

THE BULLETINS OF THE JAPANESE SERVICE.

The Central Meteorological Observatory of Japan has begun the publication of a new series of bulletins, whose purpose is thus explained in the preface to the first number.

With the present number begins a new series of our publications, under the title of the Bulletin of the Central Meteorological Observatory of Japan. The bulletin is not intended to be published periodically, yet it is proposed to issue the successive numbers at suitable intervals. This publication chiefly contains the results of researches on meteorology and allied sciences made by the members of this observatory. In addition, it is also intended that observations and their discussions on special subjects, which are not included in the routine work of our service, will be published in these reports.

We sincerely hope that by the present bulletins, together with the monthly and annual reports, the general features of meteorology of Japan may be known to the public.

The present number contains the following memoirs:

1. W. Oishi.—Observations of the earth temperature at Tokio.

A period of seven years, 1886–1892, is covered by the observations, which were made at the surface of the ground and at nine different depths, from .05 meter to 7.0 meters. The surface temperature was observed with an ordinary mercurial thermometer laid on the ground, with the bulb just covered with earth. The results, as regards daily and annual ranges and retardation of extremes, do not materially differ from those obtained elsewhere.

2. Y. Wada.—Température moyenne annuelle de la surface de la mer dans l'océan pacifique occidental.

The author presents the results of observations taken from more than 6000 logs furnished by 1086 ships, both native and foreign, and extending over a period of twenty years, from 1882 to 1901. The region studied is comprised between the one hundred and fourteenth and one hundred and forty-sixth meridians and the twenty-second and forty-sixth parallels, and extends from the Strait of Formosa to the southern corner of the Sea of Okhotsk and from the Chinese coast to about 300 miles east of the Japanese Archipelago. The total number of observations was 133,255, of which about two-thirds were taken during the warmer half of the year and 80 per cent in the Japan Sea and the waters in the neighborhood of the Archipelago proper. Mean temperatures only are considered in this paper.

The highest monthly means occurred generally in August and varied from 30° C. in the Strait of Formosa to 19° C. in the Sea of Okhotsk. The lowest means ranged from —3° in the Gulf of Pechili and in the neighborhood of Vladivostock to 16° off the west coast of Kiushu, and occurred from December to March. The greatest range of temperature occurs in the Gulf of Pechili, where a difference of 27° between the August and February means exists, while a range of but 6° is noted in the vicinity of Formosa. In general, the influence of the ocean currents on the surface temperatures is clearly shown. A table gives the monthly and annual means for each 2-degree square, and these are shown graphically on thirteen charts.

3. T. Okada.—The epochs of occurrence of the first ice in Japan for 1902.

The purpose of this investigation was not to observe the formation of ice on natural bodies of water, but to determine the relative dates of first freezing under artificial and identical conditions. The results might then be accepted as to some extent an exponent of the effect of orography upon climate, a matter of especial interest in a country with the diversified surface and latitudinal extent of Japan.

Observations were made during 1902 at twenty of the meteorological stations, using the ordinary evaporation gage, a copper cylinder two decimeters in diameter and one decimeter in depth, retaining its natural copper color on the outside, but plated on the inside with a pale white zinc alloy. These are set on the surface of ground covered with sod, freely exposed to the sun and wind, and filled with pure well water to a depth of two centimeters at 10 o'clock every morning. The author draws the following conclusions:

In all places frost precedes the ice in the evaporation gage, and the minimum air temperature below 0° C. comes after the first ice.

The date of the first ice retards in general as we proceed toward the south. The variation of the date of the first ice with latitude is about six days per degree.

The distance from the coast, the height above sea level, or orographic conditions characteristic to the *continentality* of the climate, accelerate or retard the occurrence of first ice. Take, for example, the two stations, Takayama and Fukui, under the same latitude. At the former station, lying on the plateau in central Japan, water freezes on the 5th of November, while at the latter, situated near the coast of the Sea of Japan, ice occurs first on the 25th of the same month. The difference is twenty days.

Lines showing the simultaneous occurrence of first ice run almost parallel to the coast line, showing the remarkable influence of the distribution of land and sea on the date of the first ice. The general course of the lines on the chart bears a striking resemblance to that of winter isotherms.

The topographical feature of the observing place seems to have a very great influence on the occurrence of first ice.

It is obvious that the relative dates would be modified, or even in some cases reversed, by varying the standard as regards either the amount of water, the nature of the containing vessel, or the hour at which it is filled. A wide range of experiments along these lines might be carried out. The use of distilled water would also be an improvement.

4. T. Okada.—Evaporation in Japan.

The evaporimeter used is described above. Results are presented from fifty stations, from Formosa, in the Tropics, to Nemuro, in latitude 43° north. The author finds that—

The annual variation of evaporation in this country is governed by rather simple laws. The variation of evaporation presents double maxima and minima. The evaporation increases gradually from January to May and reaches a minimum in June. Then it increases abruptly to a maximum in August, and again decreases abruptly to the minimum in January. These variations can be easily accounted for by considering the effect of the temperature and sunshine duration. * * * Evaporation is greatest in the Formosa and Liukiu islands and smallest in the eastern Hokkaido, showing undeniably the remarkable influence of the temperature on this climatological element. In Formosa, lying under the Tropics, the annual evaporation amounts to 1500 millimeters in average, while in Hokkaido, sharing the arctic climate of Kuriles, it is below 800 millimeters. * * *

The abnormally great evaporation in the Inland Sea region is due to the large amount of bright sunshine that there prevails. This portion of the country is completely surrounded by high mountain ranges, so that wet winds lose their loaded vapor by passing these gigantic barriers and turn into dry ascending currents of the air which excite the evaporation of water in that region. * * * The greatest annual evaporation is 1910 millimeters at Koshun in southern Formosa, and the least is 726 millimeters at Kushiro in eastern Hokkaido.

Mr. Okada discusses also the effects of wind, precipitation, and orography, and the reduction of evaporation for altitude, and presents, in a number of tables, the average annual, monthly, and daily evaporation, together with the figures for each month and year at sixteen selected stations.—*F. O. S.*

WEATHER BUREAU MEN AS INSTRUCTORS.

Mr. James L. Bartlett, Observer, Madison, Wis., will act as instructor in meteorology at the University of Wisconsin. The course in meteorology, which will be offered for the first time during the present school year, is described in the university catalogue as "Meteorology: an elementary course in the theory and practise of meteorology with especial reference to the work of the U. S. Weather Bureau. Second semester. Three hours per week."

Mr. Joseph L. Cline, Observer, Corpus Christi, Tex., has been appointed instructor in meteorology in the high school of that city. The board of school trustees expects to make this subject a permanent feature of the curriculum. The course will consist of the general study of meteorology; meteorological instruments, their construction and errors; laboratory work in constructing weather maps; forecasting; and climate in relation to agriculture, commerce, and mankind; effects upon the human race. Meteorology is obligatory in the junior and senior years. The class this year consists of 26 pupils, and the first lesson was given September 14, 1904. Mr. Cline states that with the exception of the State Medical College, where Dr. I. M. Cline delivered a series of lectures, this is the first educational institution in Texas to adopt a regular course in meteorology.

Mr. E. D. Emigh, Assistant Observer, Dodge, Kans., reports that the high school class in physical geography visited the office on September 27, and received instruction in the use of the instruments and the work of the office.

Mr. F. P. Chaffee, Section Director, Montgomery, Ala., spoke, on the 10th instant, before the Montgomery County Agricultural Association, on the subject of the Weather Bureau and the value of its work. He paid particular attention to the methods of protecting crops from damage by frost, and touched on the harmful effects of "long-range" forecasting as at present attempted.

RAINFALL IN FIJI.

[From the Quarterly Journal of the Royal Meteorological Society. July, 1904. vol. 30, p. 252.]

Mr. R. L. Holmes, of Delanasau, Bua, Fiji, has sent us the following summary of his rainfall for 1903. The rain gage is 77 feet above sea level, and 1 mile from the sea.

1903.	Rainfall.	No. of rainy days.	Greatest daily fall.
	Inches.		*Inches.*
January ...	7.75	16	2.02
February ..	3.68	12	1.06
March	7.37	18	4.00
April	5.25	12	1.76
May	0.78	7	0.40
June.......	1.75	5	1.23
July	3.72	7	1.64
August	0.59	3	0.25
September .	0.45	6	0.17
October....	7.59	9	3.82
November .	6.45	6	2.74
December..	7.17	18	1.25
Year...	52.55	119	4.00

The rainfall for 1903 was the lowest registered during the previous thirty-two years, the next lowest being 56.87 inches in 1878. The average for the thirty-two years is 95.08 inches. The greatest yearly fall was 159.51 inches in 1871.

The rainfall for 1893 was also greatly in defect in other parts of Fiji, as will be seen from the following amounts for 1902 and 1903 in the island of Viti Levu:

Stations.	1902.	1903.
	Inches.	*Inches.*
Vuci Maca.....	113.22	61.49
Korociriciri....	106.95	75.94
Nausori	122.79	76.35
Naitasiri	126.78	106.78
Muanaweni....	155.49	122.01
Nadarivatu	128.43	66.38
Ba	85.70	57.10
Lautoka	65.98	42.62

PROFESSOR WARD ON THE CLIMATE OF THE UNITED STATES.

Prof. Robert DeC. Ward contributes a brief and interesting account of our climate to the June number of the Geographical Teacher.[1] While the American climatologist may find no new facts in these pages, he will be interested in the concise, lucid, and comprehensive treatment of so large a subject in so small a space.

Professor Ward divides the country into three climatic zones: First. The eastern climatic province, extending from the Atlantic Ocean to the one hundredth meridian, with warm summers and cold winters, differing but little in general climatic features from east to west, but with strong winter temperature gradients from north to south; influenced but slightly by the ocean on its eastern border and subjected to the sudden local weather changes attending the passage of cyclonic storms; favored by a sufficient and seasonable rainfall, varying from 60 inches near the Gulf and on the south Atlantic coast to 20 inches at about the one hundredth meridian, so that "the world hardly contains so large an area as this so well adapted to civilized occupation."

Second. The western plateau and mountain region, lying between the one hundredth meridian and the Sierra Nevada and Cascade ranges, having great differences of altitude and

[1] The climatology of the United States; an outline. The Geographical Teacher, London. Vol. 2, pp. 212-218.

characterized by the dryness, sunshine, light rainfall, extreme seasonal differences, and large diurnal temperature ranges of a mountain climate.

Third. The Pacific coast zone, with a mild and equable climate, due to the prevailing westerly winds from the neighboring ocean, and with marked latitudinal and seasonal variations in rainfall.

Professor Ward adds a brief but useful bibliography.—*F. O. S.*

THE THIRD CONVENTION OF WEATHER BUREAU OFFICIALS.

Peoria, Ill., was chosen for the meeting place of the Third Convention of Weather Bureau Officials, held on the 20th, 21st, and 22d of September of this year. Sixty-five officials of the Bureau, from every section of the country, were in attendance. The following papers were presented:

President's address.—Prof. Willis L. Moore.

Laboratory work in meteorology.—Prof. A. G. McAdie, San Francisco, Cal.

The Mount Weather Research Observatory.—Prof. F. H. Bigelow, Washington, D. C.

A symposium on the purposes of the Mount Weather Research Observatory.

Errors of instruments and the lines along which improvements should be sought.—Prof. C. F. Marvin, Washington, D. C.

Long-range weather forecasts.—Prof. E. B. Garriott, Washington, D. C.

Seasonal forecasts.—Prof. A. G. McAdie, San Francisco, Cal.

Amplification of forecasts for the benefit of perishable products.—Dr. W. M. Wilson, Milwaukee, Wis.

An aid in forecasting.—Mr. F. H. Brandenburg, Denver, Colo.

Report of board on revision of meteorological forms.

Forecasting fogs on the Gulf coast.—Mr. B. Bunnemeyer, Providence, R. I.

A popular account of the countercurrent theory of storms.—Prof. F. H. Bigelow, Washington, D. C.

Variations in insolation and in the polarization of blue sky light during 1903 and 1904.—Mr. H. H. Kimball, Washington, D. C.

A possible method for determining the direction and velocity of storm movement.—Mr. E. H. Bowie, St. Louis, Mo.

Temperature forecasts and iron ore shipments.—Mr. H. W. Richardson, Duluth, Minn.

Distribution of forecasts by telephone.—Dr. G. M. Chappel, Des Moines, Iowa.

Practicable rules for forecasting flood crest stages for Cairo, Ill.—Mr. P. H. Smyth, Cairo, Ill.

The Columbia River.—Mr. E. A. Beals, Portland, Oreg.

Diurnal periodicities in the climate of Baltimore.—Dr. O. L. Fassig, Baltimore, Md.

Instruction and research by Weather Bureau officials.—Prof. Cleveland Abbe, Washington, D. C.

A symposium on the teaching and position of meteorology in universities and other institutions.

Phenological observations at Wauseon, Ohio.—Mr. J. Warren Smith, Columbus, Ohio.

A study of rainfall on the west Florida coast.—Mr. B. Bunnemeyer, Providence, R. I.

Climatology of Porto Rico.—Mr. W. H. Alexander, Galveston, Tex.

Monthly statement of averages for rural press.—Mr. W. S. Belden, Vicksburg, Miss.

Irregularities in frost and temperature in neighboring localities.—Dr. I. M. Cline, New Orleans, La.

Former conventions of Weather Bureau officials.—Mr. James Berry, Washington, D. C.

A full report of the convention will be published as a bulletin of the Weather Bureau.

OBSERVATIONS FOR TWELVE MONTHS IN LASSA.

Climatic data from the forbidden city of Tibet has been obtained by M. Tysbikov, a Russian traveler, who resided in Lassa from August 15, 1900, until August 22, 1901. The following summary of his observations is taken from La Géographie, vol. 9, No. 1.

The year is divided into two seasons, the dry and the wet. (The influence of the monsoons of the Indian Ocean is felt even at this point.) In 1900 the dry season began toward the end of September; up to the end of April snow fell only twice. The rains began toward the middle of May, and 48 rainy days were counted up to the middle of September. The direction of the winds is in general from west to east. The mean temperature in the shade, observed three times a day during 235 consecutive days, is 5.2° C. at dawn, 14.5° at 1 p. m., and 9° at 9 p. m. The coldest month is December (mean for the three observations respectively —7.6°, +1.40°, —2.9°); the warmest month is June (14.6°, 22.8°, 17.2°). The large streams never freeze; the small ones are covered with only a thin layer of ice.

OBSERVATIONS AT THE FRANCO-SCANDINAVIAN STATION FOR AERIAL SOUNDINGS.

In a previous number of the REVIEW[1] Mr. Leon Teisserenc de Bort has described the station for systematic and continuous kite work, established by the cooperation of the French, Danish, and Swedish meteorological services at Hald, near Viborg in Jutland. In a recent communication to the Paris Academy of Sciences, Mr. Teisserenc de Bort gives some of the results of this work.[2]

Besides the meteorological observations, properly so called, a series of measurements of insolation have been made by Messrs. Holm and Jansson, our Swedish colleagues, with the Ångström pyrheliometer The maximum insolation, 1.314 small calories, was observed in July.

The barometric depressions, of slight extent, which pass over Jutland, are preceded by a change to the south in the lower wind, this movement taking place without any change in the upper currents. The rotation of the wind therefore begins in the lower levels and then rises into the region of the cumulus and the alto-cumulus. The temperatures obtained by the sounding balloons are not notably lower in the winter season than those that are obtained in the neighborhood of Paris; but we should note the very great decrease of temperature (0.9° per 100 meters) indicated on March 15, 1903, by a balloon that recorded a temperature of —38° at an altitude of 4400 meters, while a balloon sent up on the same day near Paris recorded only —17°. The day before, the temperature at the same height was about —16°, both at Hald and at Paris. The temperatures at the earth varied but 2° between these two days, while in the upper atmosphere they decreased more than 22°. This is a striking example of the now recognized fact that the variability of climate is greater at a certain height than near the ground.

Observations by kites have shown that in a great number of cases, even with rather low pressures, the winds from southwest to northwest diminish in velocity at a certain height. Sometimes this diminution has been gradual and in proportion to the increase in altitude; sometimes the wind remained quite strong or even increased in certain zones, especially in the neighborhood of cloud layers, and then fell suddenly to so low a velocity that the kites were arrested in their upward movement as if by an invisible ceiling.

It has been several times observed that such an increase in the wind as threatened to break the kite line has been followed by so marked a calm that the kites fell to the ground, with all the line, from a height of more than 1000 meters.

These facts, and others observed by us at Trappes and on the Mediterranean, show that we can not theorize on atmospheric phenomena as if they were continuous in time or space; such cases, on the contrary, are rare, and limited to certain atmospheric conditions.

WIND VELOCITY AND OCEAN WAVES.

In connection with a study of ocean waves[3] Dr. Vaughn Cornish has prepared a table showing the relation between their height and the velocity of the wind. Taking tables previously published by Desbois, Antoine, and Paris, in which

[1] Monthly Weather Review, April, 1903, vol. 31, p. 177.

[2] Comptes Rendus, June 27, 1904, vol. 138, p. 1736.

[3] On the dimensions of deep-sea waves and their relation to meteorological and geographical conditions. The Geographical Journal, London, May, 1904, vol. 23, p. 623-645.

the wind force is estimated on scales of 0-8 or 0-11, he has reduced them all to the uniform Beaufort scale of 0-12, and has converted this into miles per hour by the table of R. H. Curtis. The resulting table is based on the averages of many hundreds of observations in all parts of the globe, and gives the height in feet of ocean waves corresponding to eighteen different wind velocities, from 2 miles to 61.8 miles. It is found that in the open sea the height of the wave in feet is, in general, one-half of the velocity of the wind in statute miles per hour. There are extreme variations from this ratio of about 20 per cent. We can not determine, from the figures given, how closely the individual observations for each velocity would agree with the general average. No close approximation to accuracy should be expected if we take into account the uncertainties in the measurement of both of the quantities considered, and remember, also, that the waves of one storm are more or less affected by those of its predecessor.

The duration of the wind has less effect than might be anticipated upon the height of the wave. The latter soon attains its maximum under a constant wind, whose further effect is to increase the length of the wave rather than its height. "The best record of this is given by Paris, who observed, to the east of the Cape of Good Hope, during strong west winds which blew with great regularity for four days, that the height of the waves increased only from 19.69 to 22.97 feet, whilst the length, which was only 370.74 feet on the first day, had attained to 771 feet on the fourth. It is, indeed, in their great wave length and almost perfect parallelism that the waves of the southern ocean differ most from those of the North Atlantic and North Pacific, where the winds veer more rapidly."—*F. O. S.*

RECORD OF DROUGHTS AT RALEIGH, N. C.

[*From the* Report for September, 1904, North Carolina Section of the Climate and Crop Service of the Weather Bureau.]

The long drought now prevailing in central North Carolina, which has lasted at Raleigh from September 21 to October 12, 1904, a period of twenty-two consecutive days without precipitation, lends interest to the previous records of drought at Raleigh, since it comes near breaking all precedents. In the former years (since 1887) Raleigh has experienced a drought of equal or slightly longer duration only twice, namely, from September 15 to October 6, 1895 (twenty-two days), and from April 28 to May 20, 1903 (twenty-three days). There have been, however, ten periods of drought lasting fifteen days, two periods lasting sixteen days, two lasting eighteen days (November 23 to December 9, 1888, and January 1 to 18, 1902), and two periods lasting nineteen days (November 18 to December 6, 1890, and September 4 to 22, 1897).

A careful calculation of all consecutive days without precipitation (traces not counted as precipitation) from 1887 to 1903 shows that the average number of consecutive dry days at Raleigh is four. The average was only three in 1891, 1894, 1898, and 1899, and was as much as five only in 1896.

CORRIGENDA.

MONTHLY WEATHER REVIEW for August, 1904, p. 361, Table 3, square 66, February; for "15" read "18."

A PACK TRAIL ON MOUNT WHITNEY.

In the MONTHLY WEATHER REVIEW for November of last year, p. 524, Prof. Alexander G. McAdie gives his computation of the altitude of Mount Whitney, with a report on its availability as a site for a meteorological observatory. He concludes that it is better adapted to this purpose than any of the other extremely high peaks on the Pacific coast. Under date of August 1, 1904, Professor McAdie writes:

I am anxious to expose a minimum thermometer on the summit of Mount Whitney, so that the lowest temperature during the coming winter at this great elevation may be obtained. It will be remembered that some experiments were made in the winters of 1897–98 and 1898–99 at Mount Lyell, elevation 13,040 feet. The minimum temperatures recorded during the two seasons were respectively —25.3° C. and —27.6° C. These were not the lowest temperatures recorded elsewhere in California during those winters.

It is thought we should make every effort to utilize the opportunity for study of atmospheric conditions in these high levels in view of the importance of the data in connection with new theories of formation and structure of cyclones and anticyclones.

I inclose copy of a letter received from Mr. G. F. Marsh, Lone Pine, Cal., relative to the completion of a pack trail to the summit of Mount Whitney. This is a matter of some importance, as it will now be possible during July and August to send supplies to the summit of Mount Whitney, elevation 14,515 feet, and so far as known the highest point in the United States, excluding Alaska.

Regarding the completion of the trail, Mr. Marsh writes to Professor McAdie:

I am very glad to inform you that we completed the pack trail to the summit of Mount Whitney last Sunday, the 18th. We had three pack trains loaded with wood, and one saddle horse. We had a large fire at night, and fireworks which were plainly seen at Lone Pine, who responded with a large fire and fireworks.

We had an ideal day to finish the trail. The weather was perfect. We were so anxious to get to the top that we never noticed the altitude. Most of the time it was bitter cold and windy. We were all fearfully sunburned; our faces were a sight and our lips almost black; but we would not give in. The pack train had no difficulty at all in climbing the mountain. The trail is in good shape and parties are going over it every day. We shall try to find some means of keeping the trail in good repair.

I think the trail will be open until about Christmas unless early storms come, but it would not be safe to say this, as we do not know how early the snow will come this year. Last year there was very little snow. But I think parties will be safe until the end of October.

In a subsequent letter, Mr. Marsh refers to a snowstorm on August 1 that compelled a party to turn back within a half mile of the monument. "The mountains are covered with a light snow now, but it melts quickly."

On October 10 Mr. W. E. Bonnett, Assistant Observer at Independence, Cal., attempted to reach the summit of Mount Whitney for the purpose of installing maximum and minimum thermometers. He was accompanied by a guide, with a pack animal and saddle animal. At an altitude of 10,000 feet snow began to fall. They proceeded about 1000 feet further, when the high wind and dense snow, which was fast blotting out the trail, compelled them to turn back.

On July 26, eight days after the completion of the trail, one man was killed by lightning at the summit during a sudden snowstorm, and two of his companions were rendered unconscious. The Redland Facts records a similar occurrence on July 24 on Mount San Gorgonio, at an elevation of 9500 feet, the first case of the kind in the history of the county. Referring to these fatalities, Professor McAdie says:

The accidents have a scientific interest in that there are but few records of deaths by lightning in this State. But it should be noted that comparatively few people have been exposed to storms at high elevations. Mr. Byrd Surby was killed on the summit of Mount Whitney, within 50 feet of the monument. It was snowing at the time of the accident. It is probably not well known that the variations in the electrical potential of the air during a snowstorm are almost as rapid and as great as those prevailing during a thunderstorm. In this present case I am inclined to think that the electrical disturbance was not localized, but simply incidental to a disturbed field which extended well over the high Sierra, Inyo, Panamaint, and Telescope ranges. Also the San Bernardino Range, and probably the mountains of Arizona. This condition lasted perhaps a fortnight.

We are indebted to the Sierra Club for the accompanying illustrations, Plates 1 and 2, which are taken from the Sierra Club Bulletin. They will give some idea of the contour of Mount Whitney and the character of its approaches.—*F. O. S.*

Plate I.

Fig. 1.—Mount Whitney.

Fig. 2.—Mount Whitney from the summit of Mount Williamson.

Plate II.

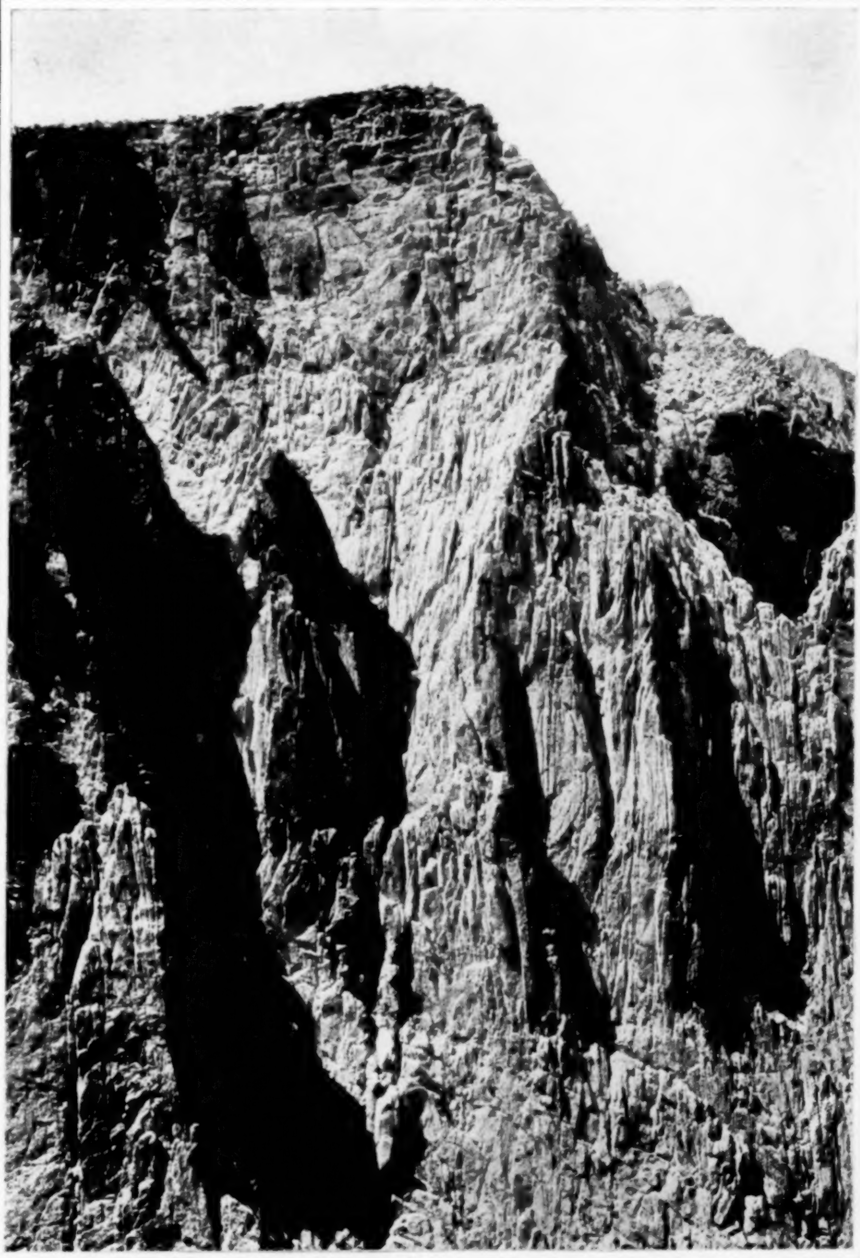

FIG. 3.—The eastern cliffs of Mount Whitney, a sheer fall of about 6000 feet. This is a partial view from the Lone Pine side. Lone Pine itself is nearly 11,000 feet below the summit, or 5000 feet lower than the bottom of the above photograph. Photograph by Prof. J. N. Le Conte.

THE WEATHER OF THE MONTH.

By Mr. WM. B. STOCKMAN, Chief, Division of Meteorological Records.

PRESSURE.

The distribution of mean atmospheric pressure is graphically shown on Chart VIII and the average values and departures from normal are shown in Tables I and VI.

The mean barometric pressure was highest over the Ohio Valley and Tennessee, Middle Atlantic States, southern New England, and the northern portion of the South Atlantic States, with the crest over the Appalachian Mountains. The minimum mean pressure occurred over interior California and the southern Plateau region, with the lowest mean, 29.84 inches, at Yuma, Ariz.

The mean pressure was above the normal throughout the country, except in portions of south-central Washington, central Oregon, and north-central California.

The greatest departures amounted to somewhat less than +.10 inch, and occurred over portions of the slope and Plateau regions, and the lower Mississippi Valley.

The mean pressure increased over that of August, 1904, in all districts, except the Florida Peninsula, extreme southern Louisiana, southeastern Texas, and along the Pacific coast.

TEMPERATURE OF THE AIR.

The distribution of maximum, minimum, and average surface temperatures is graphically shown by the lines on Chart V.

The mean temperature was below the normal in New England, lower Lake region, upper Lake region generally, northern and central South Dakota, North Dakota, along the immediate coast of Oregon and Washington, in southeastern California, Arizona, and southwestern New Mexico, with departures ranging from —2° to —3° in western Arizona, on the Washington coast, in the northern portion of the upper Lake region, eastern lower Lake region, and central and northern New England. Over the central and southern coasts of California, northern Plateau, eastern portion of the north Pacific region, southeastern portion of the middle slope and eastern portion of the southern slope regions; and the western and central portions of the Southern States, the departures ranged from + 2.0° to + 4.2°, with the greatest departures over eastern Oregon, southwestern Idaho, and east-central Mississippi.

By geographical districts the temperature was normal in the Middle Atlantic States; below normal in New England, Lake region, North Dakota, and the southern Plateau region; and above normal in all other districts. The maximum departures ranged from + 2.1° to + 3.2° and occurred in the middle and south Pacific and northern Plateau regions, and the Gulf States.

Maximum temperatures of 100°, or higher, occurred in portions of Indian Territory, Oklahoma, Texas, South Dakota, north-central Nebraska, southwestern Idaho, and western Arizona, and generally in California; and of 110°, or higher, in southeastern California and southwestern Arizona.

Freezing temperatures occurred in New England, Middle Atlantic States, northeastern Ohio, generally in Michigan, Wisconsin, Minnesota, South Dakota, North Dakota, and generally in the Plateau and northern and middle slope regions.

The mean temperature for the month was higher than the mean for any preceding September by 1° at San Luis Obispo, Cal., and Kalispell, Mont.; and 3° at Lewiston, Idaho, and Taylor, Tex.; and lower by 1° at Santo Domingo, S. D., and Puerto Principe, Cuba; 2° at Houghton, Mich., and Syracuse, N. Y. There were a number of stations where the mean for the month equaled the highest on record; also the lowest, the latter especially in the West Indies.

The maximum for the month exceeded that of any previous September by 1° at Helena, Mont., Lander, Wyo., and Pensacola, Fla.; 2° at Tacoma, Wash.; 3° at Huron, S. Dak., and Valentine, Nebr.; 4° at San Luis Obispo, Cal., and 7° at San Francisco, Cal.; and the minimum was lower by 1° at Albany and Oswego, N. Y., Northfield, Vt., and Portland, Me.; 2° at Rapid City, S. Dak., Richmond, Va., and Washington, D. C.; 4° at Binghamton, N. Y., Block Island, R. I., and Cape May, N. J.; and 5° at Eastport, Me.

The average temperatures for the several geographic districts and the departures from the normal values are shown in the following table:

Average temperatures and departures from normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	8	59.1	— 1.6	—17.5	— 1.9
Middle Atlantic	12	66.7	0.0	—16.7	— 1.9
South Atlantic	10	74.3	+ 1.0	—10.8	— 1.2
Florida Peninsula*	8	80.1	+ 0.6	+ 1.3	+ 0.1
East Gulf	9	78.5	+ 3.2	— 4.3	— 0.5
West Gulf	7	78.8	+ 2.7	+ 4.7	+ 0.5
Ohio Valley and Tennessee	11	70.1	+ 1.8	—14.5	— 1.6
Lower Lake	8	62.6	— 0.5	—21.3	— 2.4
Upper Lake	10	58.0	— 1.2	—23.1	— 2.6
North Dakota*	8	55.2	— 1.6	—22.2	— 2.5
Upper Mississippi Valley	11	65.8	+ 0.8	—21.5	— 2.4
Missouri Valley	11	66.1	+ 0.9	— 8.7	— 1.0
Northern Slope	7	59.6	+ 1.5	+ 4.0	+ 0.4
Middle Slope	6	69.1	+ 1.4	+ 4.9	+ 0.5
Southern Slope*	6	73.0	+ 0.8	+10.4	+ 1.2
Southern Plateau*	13	68.6	— 0.9	+ 3.1	+ 0.3
Middle Plateau*	8	61.6	+ 1.1	+ 3.7	+ 0.4
Northern Plateau*	12	61.8	+ 3.2	+18.4	+ 2.0
North Pacific	7	58.3	+ 1.2	0.0	0.0
Middle Pacific	5	65.0	+ 2.1	+ 3.6	+ 0.4
South Pacific	4	71.1	+ 2.8	+ 8.3	+ 0.9

*Regular Weather Bureau and selected voluntary stations.

In Canada.—Prof. R. F. Stupart says:

The mean temperature of September was higher than the average over British Columbia and the western portions of the Northwest Territories and lower than the average in all other parts of the Dominion. The largest positive departure reported was 4° at Banff, Alberta, and the largest negative 5° in the Ottawa Valley and western Quebec. In Manitoba and the eastern portions of Assiniboia and Saskatchewan the negative departure was from 1° to 2°.

PRECIPITATION.

The distribution of total monthly precipitation is shown on Chart III.

By geographic districts, the precipitation was normal in North Dakota; above normal in New England, west Gulf States, lower Lake region, upper Mississippi Valley, the middle and southern slopes, middle Plateau, and middle and south Pacific regions; and below normal in the remaining districts.

During the last few days of the month very heavy, steady rains fell over the greater portion of New Mexico, causing the most extensive and destructive floods in that Territory on record. During the several days of the continuance of the rainstorm from three to seven inches of rainfall occurred at a number of stations. The greatest damage occurred over the eastern slope of the mountains and along the valleys and lowlands of the northern portion, with nearly as destructive results over the eastern slope of the mountains in the southwestern portion.

Phenomenally heavy rains occurred from the 22d to the 26th in the central and northern portions of California, causing destructive floods and doing much damage. Occasional heavy rains fell during this period in the southern portion of the State.

Average precipitation and departure from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		*Inches.*	*Inches.*
New England	8	3.71	119	+0.6	− 0.7
Middle Atlantic	12	3.21	87	−0.5	− 6.9
South Atlantic	10	3.07	59	−2.1	−10.7
Florida Peninsula *	8	5.20	67	−2.6	− 3.3
East Gulf	9	1.70	45	−2.1	−13.1
West Gulf	7	4.40	110	+0.4	− 4.9
Ohio Valley and Tennessee	11	1.57	53	−1.4	− 7.9
Lower Lake	8	3.24	110	+0.3	+ 2.2
Upper Lake	10	3.32	97	−0.1	− 1.7
North Dakota *	8	1.28	100	0.0	+ 0.5
Upper Mississippi Valley	11	3.96	121	+0.7	+ 0.3
Missouri Valley	11	2.04	84	−0.4	+ 1.1
Northern Slope	7	0.65	68	−0.3	− 0.1
Middle Slope	6	2.12	123	+0.4	+ 3.5
Southern Slope *	6	3.44	136	+0.9	+ 1.1
Southern Plateau *	13	1.64	174	+0.7	− 0.2
Middle Plateau *	8	0.84	131	+0.2	+ 2.6
Northern Plateau *	12	0.39	39	−0.6	− 0.6
North Pacific	7	0.58	20	−2.3	− 2.3
Middle Pacific	5	3.66	482	+2.9	+ 7.5
South Pacific	4	1.40	1,400	+1.3	+ 0.8

* Regular Weather Bureau and selected voluntary stations.

In Canada.—Professor Stupart says:

The most pronounced feature of the precipitation was the excessive rainfall over the Province of Quebec, particularly in the eastern townships, where the amounts in some localities aggregated over seven inches. The fall was also in excess of the average in the Maritime Provinces and in northern and eastern Ontario. Nearly all stations in the western portions of Ontario report a deficiency which was most marked near Lake Huron and on the high lands of the more central counties.

HAIL.

The following are the dates on which hail fell in the respective States:

Arizona, 1, 4, 9–12. California, 11, 12, 21, 23–26. Colorado, 1–3, 11, 12, 17, 18, 22, 27. Delaware, 15, 27. Florida, 3, 15, 16. Georgia, 8. Illinois, 13, 18, 20, 25–27. Indiana, 11, 18. Iowa, 1, 6, 11, 17–20, 24–27. Kansas, 11, 13, 19, 26, 27. Kentucky, 8, 12. Maine, 9, 30. Michigan, 18, 25. Missouri, 1, 11, 19, 26. Nebraska, 1, 13, 23, 26–28. Nevada, 22, 23, 25, 27, 29. New Hampshire, 21. New Jersey, 15. New Mexico, 2, 12, 20, 26, 27. New York, 12. North Dakota, 24. Ohio, 2, 8, 18. Oregon, 24. Pennsylvania, 8, 9. South Dakota, 25, 28. Tennessee, 8. Texas, 4, 12, 13, 19, 21. Utah, 12, 15, 20, 22, 23, 27, 29. Vermont, 3, 30. Virginia, 27. West Virginia, 8, 9. Wisconsin, 1, 6, 18, 25, 28. Wyoming, 1, 2, 22, 26, 27.

SLEET.

The following are the dates on which sleet occurred in the respective States:

Colorado, 24. Michigan, 20. Nevada, 27.

CLEAR SKY AND CLOUDINESS.

The distribution of clear sky is graphically shown on Chart IV, and the numerical values of average daylight cloudiness, both for individual stations and by geographic districts, appear in Table I.

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	5.2	+ 0.2	Missouri Valley	4.5	+ 0.5
Middle Atlantic	4.8	0.0	Northern Slope	3.4	− 0.6
South Atlantic	4.2	− 0.6	Middle Slope	4.3	+ 1.1
Florida Peninsula	4.8	− 0.7	Southern Slope	5.4	+ 1.8
East Gulf	4.1	− 0.3	Southern Plateau	3.6	+ 1.3
West Gulf	4.8	+ 0.5	Middle Plateau	3.8	+ 1.3
Ohio Valley and Tennessee	4.6	+ 0.2	Northern Plateau	2.9	− 1.2
Lower Lake	5.2	+ 0.4	North Pacific	4.6	− 0.3
Upper Lake	6.1	+ 1.0	Middle Pacific	4.0	+ 1.2
North Dakota	5.2	+ 0.9	South Pacific	2.7	+ 0.2
Upper Mississippi Valley	5.0	+ 0.8			

The cloudiness was normal in the Middle Atlantic States; below normal in the Florida Peninsula, South Atlantic and east Gulf States, and the northern slope, northern Plateau, and north Pacific regions; and above in the remaining geographic districts. The increased cloudiness was somewhat marked in the upper Lake, middle and southern slope, southern and middle Plateau, and middle Pacific regions, as was the deficiency in the northern Plateau region.

The average cloudiness for the various districts, with departures from the normal, are shown in the preceding table.

HUMIDITY.

The relative humidity was normal in the middle Pacific region, South Atlantic States, and New England; below normal in the Florida Peninsula, east Gulf States, and the northern Plateau and north Pacific districts, and above normal in the remaining districts. The deficiency was quite marked in the northern Plateau, as was the excess in the upper Mississippi Valley, southern slope, and southern and middle Plateau regions.

The averages by districts appear in the subjoined table:

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	81	0	Missouri Valley	70	+ 4
Middle Atlantic	79	+ 2	Northern Slope	59	+ 4
South Atlantic	80	0	Middle Slope	64	+ 6
Florida Peninsula	80	− 2	Southern Slope	72	+ 9
East Gulf	75	− 1	Southern Plateau	50	+ 9
West Gulf	77	+ 3	Middle Plateau	47	+10
Ohio Valley and Tennessee	73	+ 1	Northern Plateau	44	− 7
Lower Lake	78	+ 5	North Pacific	77	− 4
Upper Lake	81	+ 4	Middle Pacific	63	0
North Dakota	71	+ 5	South Pacific	67	+ 1
Upper Mississippi Valley	79	+ 7			

WIND.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Block Island, R. I	15	84	nw.	New York, N. Y	15	68	nw.
Buffalo, N. Y	30	50	w.	Philadelphia, Pa	15	58	nw.
Cape May, N. J	15	53	nw.	Point Reyes Light, Cal	22	58	s.
Charleston, S. C	14	50	n.	Do	23	72	s.
Grand Rapids, Mich	18	58	w.	Do	26	59	nw.
Hatteras, N. C	14	51	sw.	Do	27	60	nw.
Macon, N. C	21	54	se.	Sault Ste. Marie, Mich	30	56	nw.
Nantucket, R. I	15	58	s.	Syracuse, N. Y	30	52	w.

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IV, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—Reports of 3900 thunderstorms were received during the current month as against 3155 in 1903 and 7291 during the preceding month.

The dates on which the number of reports of thunderstorms for the whole country was most numerous were: 2d, 246; 18th, 232; 1st, 227; 24th, 191; 12th, 190.

Reports were most numerous from: Iowa, 274; Illinois, 273; Missouri, 227; Wisconsin, 209.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the dates of full moon, viz, September 20 to 28, inclusive.

In Canada: Thunderstorms were reported from Halifax, 21; Grand Manan, 30; Yarmouth, 12; Quebec, 18, 20, 30; Montreal, 2, 3, 18, 20; Kingston, 3, 14; Toronto, 2, 20, 25, 29; White River, 30; Port Stanley, 2, 8, 20, 24, 26, 29; Saugeen, 2, 18, 24; Parry Sound, 2, 18; Winnipeg, 28; Qu'Appelle, 28; Swift Current, 12; Edmonton, 9, 11, 14; Hamilton, Bermuda, 17, 24.

Auroras were reported from Father Point, 9, 12; White River, 6; Minnedosa, 6; Swift Current, 5, 9, 10; Edmonton, 10, 13, 25; Prince Albert, 1, 3.

DESCRIPTION OF TABLES AND CHARTS.

By Mr. WM. B. STOCKMAN, Chief, Division of Meteorological Records.

For description of tables and charts see page 136 of REVIEW for March, 1904.

TABLE I.—*Climatological data for Weather Bureau stations, September, 1904.*

Stations.	Elevation of instruments: Barometer above sea level, feet.	Elevation of instruments: Thermometers above ground.	Elevation of instruments: Anemometer above ground.	Pressure, in inches: Actual, reduced to mean of 24 hours.	Pressure, in inches: Sea level, reduced to mean of 24 hrs.	Pressure, in inches: Departure from normal.	Temperature: Mean max. + mean min. ÷ 2.	Temperature: Departure from normal.	Temperature: Maximum.	Temperature: Date.	Temperature: Mean maximum.	Temperature: Minimum.	Temperature: Date.	Temperature: Mean minimum.	Temperature: Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation: Total.	Precipitation: Departure from normal.	Precipitation: Days with .01, or more.	Wind: Total movement, miles.	Wind: Prevailing direction.	Maximum velocity: Miles per hour.	Maximum velocity: Direction.	Maximum velocity: Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
New England.							**59.1**	**− 1.6**										**81**	**3.71**	**+ 0.6**										**5.2**	
Eastport	76	69	82	29.98	30.06	+ .03	53.6	− 2.2	72	12	61	30	22	46	22	50	47	82	5.36	+ 2.2	15	7,051	sw.	44	nw.	30	8	13	9	5.7	
Portland, Me.	103	81	117	29.96	30.08	+ .03	57.3	− 2.4	85	12	65	32	23	49	27	53	49	78	3.49	+ 0.4	10	6,380	s.	43	nw.	30	11	8	11	5.5	
Concord	298	70	79	29.77	30.10	+ .04	57.2	− 3.0	86	12	69	26	23	46	37	.....	.....	.....	4.68	+ 1.4	12	3,417	se.	25	nw.	30	12	8	10	5.2	
Northfield	876	16	60	29.14	30.10	+ .04	53.0	− 3.0	80	18	64	23	23	42	37	50	47	82	5.06	+ 2.3	17	5,749	s.	34	nw.	30	9	5	16	6.5	
Boston	125	115	181	29.96	30.10	+ .03	62.5	+ 0.1	86	12	71	35	22	54	27	57	53	76	5.57	+ 2.7	12	6,995	sw.	40	n.	15	13	8	9	5.1	
Nantucket	12	43	82	30.09	30.10	+ .02	61.9	− 0.8	77	4	67	44	22	56	21	58	56	84	0.78	− 2.5	5	8,869	sw.	58	s.	15	10	17	3	4.9	
Block Island	26	11	46	30.07	30.10	+ .02	62.6	− 1.0	78	4	68	38	22	57	23	59	56	82	1.29	− 1.6	7	11,080	sw.	84	nw.	15	14	13	3	3.9	
Narragansett	.....	9	38	.....	.....	.....	61.5	− 0.7	80	4	69	32	22	54	26	.....	.....	.....	2.18	− 1.0	11	.....	w.	.....	.....	.....	16	8	6	.....	
New Haven	106	116	154	29.99	30.10	+ .03	62.4	− 1.1	81	4	71	34	22	54	26	58	55	80	4.96	+ 1.2	10	5,956	n.	37	w.	30	9	11	10	5.1	
Mid. Atlantic States.							**66.7**	**0.0**										**79**	**3.21**	**− 0.5**										**4.8**	
Albany	97	102	115	29.99	30.09	+ .02	61.1	− 2.0	84	3	70	32	23	52	28	55	52	78	3.88	+ 0.5	16	5,609	s.	30	w.	30	10	12	8	5.2	
Binghamton	875	79	90	29.16	30.09	+ .02	59.6	− 1.4	86	3	70	27	23	50	35	.....	.....	.....	4.21	+ 0.9	12	5,650	e.	26	nw.	30	6	14	10	6.3	
New York	314	108	350	29.76	30.10	+ .02	65.9	0.0	84	12	72	40	22	50	22	61	58	80	3.18	− 0.5	8	7,107	s.	68	nw.	15	11	9	10	5.1	
Harrisburg	374	94	104	29.71	30.11	+ .03	65.4	+ 1.0	88	3	74	37	22	57	28	59	56	77	1.69	− 2.4	10	3,912	e.	36	w.	30	12	10	8	4.7	
Philadelphia	117	116	184	29.99	30.12	+ .04	67.5	+ 0.4	87	12	75	40	22	60	25	60	56	73	7.21	+ 3.9	6	6,767	sw.	58	nw.	15	10	13	7	4.6	
Scranton	805	111	119	29.25	30.10	+ .03	62.0	.....	87	3	72	31	22	52	32	57	54	79	3.33	.....	14	4,672	sw.	34	nw.	30	10	10	10	5.6	
Atlantic City	52	39	48	30.05	30.10	+ .03	67.4	+ 0.7	86	4	73	39	22	62	22	63	60	79	1.02	− 2.5	4	5,931	sw.	41	se.	15	13	5	12	4.9	
Cape May	17	47	51	30.11	30.13	+ .06	67.6	− 0.5	82	4	73	38	22	62	21	64	.....	.....	0.90	− 2.7	5	5,500	s.	53	nw.	15	12	14	4	4.0	
Baltimore	123	69	117	29.96	30.10	+ .02	68.2	+ 0.3	87	12	76	40	22	60	29	62	59	76	5.90	+ 2.0	8	4,254	ne.	40	n.	15	10	7	13	5.5	
Washington	112	59	76	29.99	30.10	+ .02	67.4	− 0.4	90	3	77	36	23	58	31	62	60	82	5.34	+ 1.6	4	3,722	s.	34	nw.	14	10	15	5	4.4	
Cape Henry	18	11	58	30.08	30.10	+ .04	72.2	+ 0.4	93	3	79	52	22	66	25	.....	.....	.....	2.18	− 2.4	6	9,194	s.	50	s.	14	8	14	8	5.3	
Lynchburg	681	83	88	29.38	30.12	+ .04	69.0	0.0	91	3	80	37	23	58	34	62	60	81	1.47	− 2.3	6	2,118	sw.	23	nw.	15	12	15	3	3.9	
Norfolk	91	102	111	30.01	30.11	+ .05	71.6	+ 0.5	90	4	79	51	23	64	24	65	63	79	4.02	− 0.5	6	5,596	ne.	48	sw.	14	11	13	6	4.6	
Richmond	144	82	90	29.97	30.12	+ .05	70.9	.....	92	3	81	43	23	61	29	.....	.....	.....	3.00	.....	3	3,019	sw.	30	w.	14	19	6	5	3.2	
Wytheville	2,293	40	47	27.77	30.16	+ .09	64.6	+ 1.0	86	29	77	36	16	52	39	58	55	82	0.75	− 2.6	7	2,851	w.	23	nw.	14	14	13	3	4.0	
S. Atlantic States.							**74.3**	**+ 1.0**										**80**	**3.07**	**− 2.1**										**4.2**	
Asheville	2,255	53	75	27.82	30.12	+ .05	67.1	+ 1.8	87	29	78	43	16	56	34	59	56	79	2.13	− 1.2	5	3,459	se.	27	nw.	14	10	19	1	4.6	
Charlotte	773	68	76	29.29	30.12	+ .05	72.2	+ 1.1	90	12	82	46	23	62	27	64	61	75	1.78	− 1.6	7	3,936	ne.	19	sw.	20	12	13	5	4.0	
Hatteras	11	12	47	30.08	30.09	+ .03	74.2	+ 0.5	86	3	80	57	22	69	16	70	68	84	3.79	− 2.6	8	8,823	ne.	51	sw.	14	19	3	8	3.7	
Raleigh	376	71	79	29.71	30.10	+ .03	71.2	+ 0.7	89	3	81	43	23	61	29	65	62	81	5.23	+ 2.0	6	3,882	ne.	35	nw.	14	11	17	2	4.3	
Wilmington	78	82	90	29.99	30.07	+ .02	73.4	− 0.2	90	30	82	48	23	65	27	68	66	86	1.75	− 4.7	7	4,944	ne.	45	s.	14	15	12	3	3.7	
Charleston	48	14	92	30.04	30.09	+ .05	76.6	+ 0.6	94	30	83	58	23	70	20	70	68	81	3.17	− 3.4	6	6,987	se.	50	n.	14	10	13	7	4.5	
Columbia, S. C.	351	167	175	29.72	30.10	+ .05	75.3	+ 0.3	94	30	85	50	23	66	26	66	62	71	2.50	− 1.6	5	6,025	ne.	42	nw.	14	14	12	4	4.0	
Augusta	180	89	97	29.90	30.09	+ .04	77.1	+ 2.7	96	30	88	55	23	66	31	68	65	74	1.42	− 2.5	4	3,462	ne.	27	sw.	4	19	8	3	3.4	
Savannah	65	81	89	30.02	30.09	+ .06	77.6	+ 1.8	95	30	86	61	24	69	24	70	68	83	2.86	− 3.3	5	4,724	ne.	28	ne.	23	17	10	3	4.0	
Jacksonville	43	101	129	30.00	30.05	+ .05	78.0	+ 0.4	93	15	86	65	25	70	22	72	70	83	6.09	− 2.3	12	5,881	ne.	39	n.	21	10	10	10	5.4	
Florida Peninsula.							**80.7**	**+ 0.2**										**80**	**4.72**	**− 3.6**										**4.8**	
Jupiter	28	10	48	29.98	30.02	+ .06	80.0	+ 0.4	88	6	85	72	24	75	14	75	73	81	8.92	− 0.6	16	7,038	se.	38	e.	23	9	15	6	5.3	
Key West	22	10	53	29.96	29.98	+ .04	82.0	− 0.5	90	15	87	73	23	77	16	75	73	77	3.55	− 3.9	16	6,092	e.	27	ne.	15	7	19	4	5.0	
Sand Key	25	40	71	29.94	29.96	.....	81.0		91	13	85	70	15	77	16	.....	.....	.....	2.79	.....	14	9,886	e.	48	n.	15	10	14	6	4.8	
Tampa	34	60	67	29.99	30.02	+ .05	80.2	+ 0.6	93	2	89	66	25	72	21	73	71	83	1.68	− 6.2	13	3,787	ne.	27	se.	3	11	18	1	4.2	
East Gulf States.							**78.5**	**+ 3.2**										**75**	**1.70**	**− 2.1**										**4.1**	
Atlanta	1,174	190	216	28.88	30.10	+ .05	75.4	+ 3.9	92	29	84	53	23	66	26	65	60	67	0.56	− 3.2	2	6,528	e.	27	e.	22	7	20	3	4.7	
Macon	370	93	99	29.71	30.10	+ .07	76.7	.....	95	30	87	58	23	66	26	.....	.....	.....	1.34	.....	3	3,345	e.	54	se.	21	13	13	4	3.9	
Pensacola	56	79	96	30.01	30.07	+ .08	80.5	+ 3.0	96	30	87	69	16	74	20	.....	.....	.....	0.29	− 4.5	4	5,616	ne.	24	ne.	23	11	17	2	4.3	
Birmingham	700	136	143	29.34	30.09	+ .06	77.1	+ 2.2	96	29	87	52	16	67	33	.....	.....	.....	0.44	− 2.4	3	4,354	ne.	26	n.	20	14	13	3	3.7	
Mobile	57	88	96	30.00	30.06	+ .06	79.7	+ 2.9	94	29	88	65	16	72	23	72	70	79	1.92	− 3.2	9	3,899	n.	31	se.	22	13	13	4	4.3	
Montgomery	223	100	112	29.83	30.05	+ .03	78.6	+ 3.0	97	30	89	57	16	68	31	70	66	72	0.78	− 2.2	4	3,174	n.	24	sw.	3	18	10	2	3.6	
Meridian	375	84	93	29.68	30.06	+ .04	77.0	+ 4.0	94	29	88	52	16	66	35	.....	.....	.....	6.53	+ 3.7	6	2,342	sw.	34	se.	22	12	14	4	4.4	
Vicksburg	247	62	74	29.78	30.03	+ .01	78.8	+ 3.5	93	29	88	60	15	70	24	71	68	78	0.26	− 3.2	2	3,485	ne.	19	e.	12	12	17	1	3.9	
New Orleans	51	88	121	29.99	30.04	+ .06	81.2	+ 2.9	94	30	88	72	3	74	18	73	71	78	2.84	− 1.8	13	4,144	se.	29	se.	6	14	11	5	4.5	
West Gulf States.							**78.8**	**+ 2.7**										**77**	**4.40**	**+ 0.4**										**4.8**	
Shreveport	249	77	84	29.78	30.05	+ .05	79.4	+ 3.9	96	1	89	60	15	69	25	70	67	74	1.93	− 1.8	4	3,840	se.	24	ne.	14	16	8	6	4.2	
Fort Smith	457	79	94	29.57	30.04	+ .03	75.6	+ 3.3	96	9	86	48	15	65	31	67	64	75	2.91	− 0.6	10	4,428	e.	42	nw.	2	9	14	7	4.6	
Little Rock	357	93	100	29.69	30.06	+ .03	76.1	+ 3.2	93	9	85	53	15	67	29	67	64	73	0.86	− 2.3	8	4,042	nw.	29	nw.	2	11	12	7	4.8	
Corpus Christi	20	48	53	29.98	30.00	+ .05	80.4	+ 1.6	89	1	85	70	14	76	13	75	74	82	7.82	+ 3.1	19	7,226	se.	31	se.	12	7	13	10	5.4	
Fort Worth	670	106	114	29.34	30.05	+ .06	77.8	.....	96	2	87	57	15	69	26	.....	.....	.....	2.63	.....	6	6,475	s.	34	ne.	11	15	14	1	4.0	
Galveston	54	106	112	29.98	30.03	+ .05	81.5	+ 2.0	88	9	86	70	8	77	17	75	73	78	5.43	− 0.8	9	6,416	se.	24	se.	28	15	13	2	3.6	
Palestine	510	73	79	29.51	30.03	+ .04	78.5	+ 2.8	93	2	88	62	15	69	24	70	68	79	4.08	+ 0.8	9	3,593	s.	22	nw.	3	8	15	7	5.2	
San Antonio	701	80	91	29.28	30.00	+ .04	79.8	+ 2.3	96	2	89	65	9	71	26	71	68	76	7.74	+ 4.3	11	4,218	se.	23	se.	27	9	16	5	5.2	
Taylor	583	55	63	29.42	30.02	+ .05	79.1	.....	95	2	89	63	9	69	31	.....	.....	.....	2.43	.....	7	4,638	s.	34	se.	21	1	20	9	6.6	
Ohio Val. and Tenn.							**70.1**	**+ 1.8**										**73**	**1.57**	**− 1.4**										**4.6**	
Chattanooga	762	106	112	29.32	30.12	+ .06	73.6	+ 2.9	94	29	85	47	16	62	35	64	61	73	1.07	− 2.6	8	3,560	w.	24	nw.	14	12	13	5	4.8	
Knoxville	1,004	35	88	29.07	30.11	+ .05	72.2	+ 2.9	92	29	84	45	16	61	35	63	60	76	1.10	− 1.6	8	3,800	sw.	42	nw.	12	12	11	7	4.7	
Memphis	397	146	154	29.67	30.09	+ .06	75.6	+ 3.5	92	10	84	50	15	67	28	69	66	78	0.58	− 2.5	4	5,332	sw.	24	n.	14	16	8	6	4.1	
Nashville	546	122	134	29.53	30.10	+ .04	74.0	+ 3.3	94	28	85	44	16	63	39	64	60	70	0.81	− 3.2	7	3,696	sw.	24	n.	18	15	10	5	4.0	
Lexington	989	75	102	29.05	30.09	+ .03	69.4	+ 0.5	90	11	79	43	15	60	31	.....	.....	.....	1.71	− 0.8	8	6,097	s.	36	n.	18	12	13	5	4.2	
Louisville	525	114	136	29.53	30.11	+ .05	72.1	+ 2.7	94	11	82	48	16	62	33	62	58	68	2.65	− 0.2	7	4,848	sw.	27	n.	18	12	10	8	4.5	
Evansville	431	72	82	29.62	30.08	+ .02	71.8	.....	91	1	81	48	16	62	33	.....	.....	.....	5.67	.....	12	4,238	s.	30	n.	18	14	14	2	3.6	
Indianapolis	822	154	164	29.21	30.10	+ .04	67.0	+ 1.0	87	11	76	46	16	58	28	60	56	76	3.96	+ 1.0	10	6,231	s.	34	nw.	11	10	11	9	5.2	
Cincinnati	628	152	160	29.42	30.09	+ .02	69.9	+ 1.8	90	11	80	46	16	60	32	61	55	67	1.28	− 1.1	9	4,072	sw.	24	sw.	29	9	12	9	5.1	
Columbus	824	173	190	29.23	30.10	+ .03	67.1	+ 1.9	90	11	78	40	22	56	33	59	55	73	0.83	− 1.8	9	6,949	s.	44	sw.	29	13	10	7	4.7	
Pittsburg	842	336	352	29.19	30.09	+ .01	67.6	+ 0.9	88	2	77	39	22	58	31	59	54	69	2.35	− 0.2	8	5,852	sw.	38	w.	29	8	19	3	4.7	
Parkersburg	638	77	84	29.44	30.12	+ .04	68.8	+ 0.6	91	29	80	42	22	57	37	60	56	72	0.79	− 2.1	4	3,486	sw.	31	nw.	14	12	11	7	1.5	
Elkins	1,940	41	50	28.10	30.13	+ .07	63.4	+ 1.1	85	2	78	33	22	49	42	56	54	86	1.70	− 2.0	10	1,973	n.	21	w.	30	7	14	9	5.7	
Lower Lake Region.							**62.6**	**− 0.5**										**73**	**3.24**	**+ 0.3**										**5.2**	
Buffalo	767	178	206	29.24	30.07	+ .01	61.4	− 0.7	84	2	68	40	23	54	29	56	53	77	2.11	− 1.2	10	10,153	sw.	50	w.	30	9	8	13	6.0	
Oswego	335	76	91	29.69	30.06	.00	59.4	− 2.8	86	2	67	35	23	52	28	55	52	79	3.24	+ 0.4	11	7,041	s.	31	n.	20	11	9	10	4.9	
Rochester	523	81	102	29.51	30.08	+ .02	61.1	− 0.9	88	2	70	37	22	52	31	56	53	80	3.95	+ 1.6	11	5,693	sw.	33	w.	30	8	12	10	5.7	
Syracuse	597	97	113	29.43	30.08	+ .01	59.8	.....	86	3	68	36	22	52	29	.....	.....	.....	2.29	.....	9	6,376	s.	52	w.	30	10	6	14	5.9	
Erie	713	92	102	29.31	30.08	+ .02	62.8	− 0.8	88	2	70	37	22	56	29	57	54	75	2.78	− 1.2	11	7,459	s.	33	w.	29	11	9	10	5.3	
Cleveland	762	190	201	29.27	30.09	+ .03	63.4	− 0.4	86	2	71	36	22	56	30	58	55	78	3.62	+ 0.2	9	10,102	se.	48	nw.	14	12	10	8	4.7	
Sandusky	629	62	70	29.40	30.08	+ .02	64.8	− 0.3	89	2	72	38	22	57	28	.....	.....	.....	3.06	+ 0.2	10	5,789	sw.	33	nw.	14	11	14	5	3.9	
Toledo	628	120	127	29.41	30.09	+ .03	64.6	+ 0.7	89	11	73	40	21	56	29	58	55	77	2.94	+ 0.6	10	6,568	sw.	39	w.	2	13	10	7	4.6	
Detroit	730	153	193	29.28	30.08	+ .02	63.6	+ 0.7	86	2	72	40	22	56	27	57	54	78	4.23	+ 1.8	12	7,453	sw.	41	se.	26	8	15	7	5.6	
Upper Lake Region.							**58.0**	**− 1.2**										**81**	**3.32**	**− 0.1**										**6.1**	
Alpena	609	63	80	29.38	30.05	+ .02	56.8	− 0.4	84	10	66	31	22	48	33	52	50	81	1.99	− 1.8	8	7,550	se.	48	nw.	30	7	14	9	5.4	
Escanaba	612	40	48	29.36	30.03	+ .02	54.6	− 2.1	80	29	62	31	21	47	25	51	49	84	4.73	+ 1.2	11	5,587	s.	28	nw.	30	7	13	10	5.8	
Grand Rapids	707	127	165	29.29	30.06	+ .02	62.2	− 0.7	85	10	71	36	21	54	33	56	53	78	4.18	+ 0.8	8	7,539	s.	58	w.	18	6	10	14	6.3	
Houghton	668	66	74	29.27	30.00	.00	53.8	.....	77	9	61	33	22	47	28	.....	.....	.....	4.18	.....	13	5,140	e.	28	e.	2	9	10	11	5.9	
Marquette	734	76	116	29.22	30.03	+ .03	54.2	− 2.6	79	29	61	36	21	47	27	50	46	79	2.65	− 1.2	17	7,677	nw.	45	sw.	23	5	12	13	6.8	
Port Huron	638	70	120	29.40	30.09	+ .03	60.9	− 0.3	84	2	69	33	22	52	26	56	53	80	2.22	− 0.4	10	7,719	sw.	42	nw.	11	12	7	11	5.4	
Sault Ste. Marie	614	40	61	29.35	30.02	.00	52.7	− 2.8	75	10	60	29	22	45	30	49	46	85	4.25	− 0.2	15	6,376	nw.	56	nw.	30	8	12	10	6.0	T.
Chicago	823	241	274	29.19	30.08	+ .04	64.5	+ 0.3	87	10	71	47	21	58	26	58	55	77	2.65	− 0.2	7	11,754	sw.	46	sw.	25	6	11	13	6.1	
Milwaukee	681	124	142	29.33	30.06	+ .03	62.3	+ 1.1	88	10	70	45	15	54	32	57	54	81	2.64	− 0.2	10	7,679	w.	42	se.	25	6	6	18	6.9	
Green Bay	617	49	86	29.37	30.03	+ .01	59.4	− 1.1	84	10	68	34	21	50	35	54	50	80	4.44	+ 1.1	10	7,466	se.	39	sw.	29	5	14	11	6.4	
Duluth	1,133	11	47	28.79	30.02	+ .04	52.2	− 3.2	76	29	59	32	21	45	26	48	45	85	3.48	− 0.4	11	9,264	ne.	48	ne.	2	8	11	11	6.1	

TABLE I.—*Climatological data for Weather Bureau stations, September, 1904*—Continued.

Stations.	Elevation of instruments: Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Pressure, in inches: Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hrs.	Departure from normal.	Temperature of the air, in degrees Fahrenheit: Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches: Total.	Departure from normal.	Days with .01, or more.	Wind: Total movement, miles.	Prevailing direction.	Maximum velocity: Miles per hour.	Direction.	Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
North Dakota.							55.4	− 0.9										71	1.80	+ 0.6										5.2	
Moorhead	935	54	60	29.01	30.04	+ .08	55.4	− 1.1	86	9	66	30	20	45	36	50	47	81	4.24	+ 2.2	11	6,584	nw.	33	se.	22	13	6	11	5.4	
Bismarck	1,674	16	29	28.25	30.03	+ .09	56.6	− 0.4	87	9	70	28	20	44	44	48	43	70	1.03	− 0.1	3	6,349	nw.	33	n.	15	18	4	8	4.0	
Williston	1,875	14	44	28.02	30.00	+ .07	54.2	− 1.3	92	7	70	21	20	38	52	45	38	63	0.12	− 0.7	2	5,846	se.	38	n.	15	8	8	14	6.0	
Upper Miss. Valley.							65.8	+ 0.8										79	3.96	+ 0.7										5.0	
Minneapolis	......	99	208	......	......	......	59.7	− 2.5	83	28	68	38	21	51	30	......	......	......	3.19	+ 0.7	7	9,113	se.	40	e.	5	6	11	13		
St. Paul	837	171	179	29.10	30.00	+ .01	59.8	0.0	83	28	68	39	15	52	30	54	50	76	4.50	+ 1.5	8	7,405	nw.	36	w.	2	11	6	13	5.6	
La Crosse	714	71	87	29.27	30.03	+ .02	62.2	+ 0.6	89	28	71	37	21	53	35	......	......	......	4.98	+ 0.8	9	5,309	s.	32	nw.	1	8	13	9	5.6	
Davenport	606	71	79	29.39	30.03	.00	65.6	+ 0.9	89	10	75	42	15	56	27	62	60	87	3.98	+ 0.8	8	4,848	sw.	24	ne.	25	11	9	14	5.7	
Des Moines	861	84	99	29.14	30.07	+ .05	65.2	+ 1.1	89	1	75	38	15	55	31	59	56	79	1.95	− 1.2	10	5,855	sw.	35	ne.	19	8	14	8	5.6	
Dubuque	698	100	117	29.30	30.05	+ .02	64.2	+ 1.0	89	28	73	39	15	55	37	57	54	74	2.21	− 1.9	8	4,791	se.	28	n.	25	6	13	11	6.5	
Keokuk	614	63	78	29.39	30.03	.00	68.2	+ 1.8	89	28	77	42	15	59	27	61	58	79	8.33	+ 4.8	8	5,136	sw.	30	w.	2	15	9	6	3.8	
Cairo	356	87	93	29.71	30.09	+ .04	72.4	+ 2.5	90	11	81	49	15	64	26	66	63	81	1.91	− 0.6	10	4,687	s.	38	ne.	18	7	16	7	5.1	
Springfield, Ill.	644	82	93	29.39	30.07	+ .02	67.2	+ 0.8	90	28	77	44	21	57	27	61	58	78	3.96	+ 0.8	8	5,933	s.	27	ne.	20	13	8	9	4.8	
Hannibal	534	75	109	29.49	30.06	+ .03	68.2	+ 1.5	89	28	78	40	15	59	29	......	......	......	5.63	+ 2.5	9	6,162	sw.	36	sw.	19	16	9	5	3.4	
St. Louis	567	208	217	29.47	30.07	+ .03	72.0	+ 1.6	89	28	80	50	21	62	27	63	60	75	2.97	− 0.2	10	6,551	s.	28	n.	14	16	6	8	4.4	
Missouri Valley.							66.1	+ 0.9										70	2.04	− 0.4										4.5	
Columbia, Mo.	784	11	84	29.23	30.05	+ .02	69.2	− 0.3	92	10	80	38	15	58	35	......	......	......	5.79	+ 2.5	7	4,582	s.	27	e.	18	16	6	6	3.6	
Kansas City	963	78	95	29.06	30.08	+ .06	70.8	+ 3.3	92	27	80	46	14	62	26	63	60	74	2.41	− 1.0	7	5,582	s.	24	s.	17	17	6	7	3.8	
Springfield, Mo	1,324	98	104	28.69	30.08	+ .05	71.0	+ 3.3	90	26	80	46	15	62	25	63	61	77	1.20	− 2.6	7	6,440	s.	25	nw.	13	20	4	6	3.5	
Topeka	......	85	89	......	......	......	70.6	+ 1.9	94	9	81	43	15	60	34	......	......	......	4.35	+ 1.0	9	6,254	sw.	42	sw.	27	14	8	8	4.2	
Lincoln	1,189	75	84	28.77	30.02	+ .03	66.5	+ 0.4	94	9	78	40	14	55	35	58	54	72	2.96	+ 0.9	8	6,626	se.	34	nw.	13	15	4	11	4.5	
Omaha	1,105	115	121	28.86	30.04	+ .04	66.3	+ 1.5	89	28	76	42	14	56	32	59	55	73	2.60	− 0.3	8	5,761	s.	37	sw.	23	12	5	13	5.3	
Valentine	2,598	47	54	27.35	30.05	+ .09	61.8	+ 0.2	102	9	77	27	14	47	45	51	45	65	1.17	+ 0.2	3	7,379	nw.	44	s.	27	11	11	8	4.4	
Sioux City	1,135	96	164	28.82	30.02	+ .04	63.3	− 1.9	92	9	74	40	21	52	37	......	......	......	0.86	− 1.2	5	8,324	se.	39	nw.	1	12	4	14	5.3	
Pierre	1,572	43	50	28.36	30.02	+ .07	63.6	− 0.1	101	9	76	36	14	51	46	52	45	60	0.20	− 0.8	3	5,273	nw.	35	w.	12	12	8	10	4.7	
Huron	1,306	56	67	28.64	30.04	+ .08	60.1	0.0	106	9	74	29	21	46	54	51	46	71	0.26	− 1.2	4	8,384	se.	39	s.	12	7	15	8	5.3	
Yankton	1,233	42	49	28.70	30.01	+ .03	63.5	+ 1.4	101	9	76	35	21	50	49	......	......	......	0.69	− 2.2	5	4,745	nw.	29	s.	12	12	11	7	5.1	
Northern Slope.							59.6	+ 1.5										59	0.65	− 0.3										3.4	
Havre	2,505	11	44	27.38	30.01	+ .07	56.6	+ 1.7	91	7	73	24	14	40	56	48	41	63	0.26	− 0.9	4	5,373	nw.	35	nw.	12	19	10	1	3.0	T.
Miles City	2,371	42	50	27.51	30.00	+ .05	61.4	+ 1.4	95	8	77	30	14	46	45	54	50	76	0.22	− 0.5	2	3,597	nw.	24	w.	28	18	10	2	3.5	
Helena	4,110	88	94	25.87	30.03	+ .06	59.6	+ 3.8	91	8	73	33	13	46	43	46	34	47	0.01	− 1.1	1	5,067	sw.	35	n.	17	14	13	3	4.0	
Kalispell	2,965	45	51	26.96	29.99	+ .03	55.6	......	86	7	70	32	21	42	41	46	37	57	0.40	......	1	3,940	w.	23	sw.	8	21	8	1	2.7	
Rapid City	3,234	46	50	26.66	30.00	+ .04	60.6	− 0.8	96	9	74	23	14	47	49	50	42	58	0.43	− 0.1	2	6,042	se.	30	nw.	5	22	2	6	2.7	
Cheyenne	6,088	56	64	24.14	30.04	+ .08	58.0	+ 1.8	87	8	72	29	14	44	40	44	34	51	0.83	0.0	8	5,453	nw.	36	w.	21	11	12	7	4.4	
Lander	5,372	26	36	24.73	30.04	+ .08	56.8	+ 1.0	89	8	74	25	14	39	50	45	38	56	0.39	− 0.5	2	2,438	sw.	26	sw.	18	16	9	5	3.4	
Yellowstone Park	6,200	11	47	23.97	30.04	+ .07	52.3	......	82	8	68	27	13	37	41	40	30	53	0.73	......	6	4,705	sw.	34	w.	22	20	8	2	2.9	
North Platte	2,821	43	52	27.15	30.05	+ .08	64.0	+ 1.6	97	8	79	29	14	49	45	53	47	66	2.40	+ 1.1	3	4,957	nw.	35	se.	27	11	15	4	4.8	
Middle Slope.							69.1	+ 1.4										64	2.12	+ 0.4										4.3	
Denver	5,291	79	151	24.83	30.03	+ .07	63.1	+ 1.2	90	9	77	38	14	49	38	50	41	53	1.77	+ 1.0	6	5,246	s.	36	n.	12	12	13	5	4.1	
Pueblo	4,685	80	86	25.38	30.01	+ .05	65.5	+ 0.3	89	8	80	41	12	51	46	51	42	51	1.48	+ 1.1	5	4,497	se.	30	n.	13	10	17	3	4.1	
Concordia	1,398	42	47	28.58	30.03	+ .04	69.1	+ 1.3	100	9	81	38	14	57	44	60	56	72	1.54	− 0.9	8	4,710	s.	29	sw.	28	16	6	8	4.3	
Dodge	2,509	44	54	27.46	30.02	+ .04	70.0	+ 2.4	98	26	83	41	14	57	45	58	53	65	1.82	+ 0.5	5	6,983	s.	36	se.	28	13	7	10	4.9	
Wichita	1,358	78	86	28.63	30.04	+ .04	73.1	+ 3.1	97	26	85	46	14	62	35	[illegible]	58	70	3.10	+ 0.2	9	5,698	s.	30	sw.	1	15	11	4	4.0	
Oklahoma	1,214	79	86	28.77	30.02	+ .03	74.0	+ 0.2	96	9	83	50	15	64	30	65	61	72	3.00	+ 0.4	7	7,621	s.	32	n.	13	12	13	5	4.3	
Southern Slope.							72.0	+ 1.0										72	3.28	+ 0.8										5.4	
Abilene	1,738	45	54	28.24	30.02	+ .06	74.8	+ 0.2	96	1	83	56	15	66	30	67	63	76	3.02	+ 0.6	8	4,963	se.	23	se.	17	9	2	19	6.6	
Amarillo	3,676	10	49	26.34	30.02	+ .06	69.3	+ 1.9	92	26	80	46	15	59	32	59	55	69	3.55	+ 1.0	6	8,961	s.	46	se.	28	16	8	6	4.3	
Southern Plateau.							70.0	− 1.2										50	2.01	+ 1.1										3.6	
El Paso	3,762	10	110	26.23	29.93	+ .05	72.4	− 0.7	95	2	82	57	15	62	32	60	55	64	3.50	+ 2.4	10	6,199	e	43	sw.	1	6	16	8	6.1	
Santa Fe	7,013	33	39	23.37	29.96	+ .03	60.8	+ 0.9	78	7	72	43	7	50	35	48	39	54	5.37	+ 3.9	13	5,095	ne.	37	se.	29	18	9	3	3.6	
Flagstaff	6,907	12	25	23.45	29.95	+ .06	55.4	− 3.0	77	2	70	26	28	40	39	45	38	64	1.39	− 0.7	8	4,582	n.	37	sw.	23	15	11	4	3.7	
Phoenix	1,108	50	56	28.73	29.86	+ .05	80.5	− 0.9	102	2	94	52	28	67	35	63	51	41	1.23	+ 0.6	2	3,091	e.	28	n.	13	22	4	4	2.7	
Yuma	141	16	46	29.70	29.84	+ .06	82.0	− 2.7	104	6	95	57	27	69	36	65	55	47	0.24	+ 0.1	2	3,930	sw.	38	e.	3	22	5	3	1.9	
Independence	3,910	51	58	26.00	29.93	+ .07	69.1	− 0.9	94	5	80	44	27	58	30	51	34	33	0.32	+ 0.2	4	5,334	nw.	31	se.	23	17	7	6	3.5	
Middle Plateau.							63.3	+ 1.1										47	0.82	+ 0.2										3.8	
Carson City	4,720	82	92	25.32	29.96	+ .01	60.4	+ 0.9	91	7	76	33	28	45	42	48	39	54	0.17	− 0.1	5	3,627	sw.	38	sw.	21	15	6	9	4.2	
Winnemucca	4,344	59	70	25.65	30.00	+ .07	61.2	+ 1.1	92	7	78	34	28	44	48	48	40	55	1.15	+ 0.8	9	4,353	ne.	37	w.	21	16	5	9	3.8	
Modena	5,479	10	43	24.68	29.97	+ .05	60.6	+ 0.7	89	8	76	31	27	45	40	46	35	48	2.02	+ 1.6	5	7,815	w.	48	w.	22	14	15	1	3.8	
Salt Lake City	4,366	105	110	25.65	29.96	+ .01	66.4	+ 2.1	92	8	78	38	28	55	33	49	34	34	0.12	− 0.8	2	4,311	se.	29	s.	24	16	8	6	3.5	
Grand Junction	4,608	43	51	25.43	29.98	+ .03	67.8	+ 0.6	92	7	81	37	28	54	35	51	39	42	0.65	− 0.3	5	3,973	se.	24	nw.	1	18	9	3	3.5	
Northern Plateau.							63.4	+ 3.2										44	0.39	− 0.4										2.9	
Baker City	3,471	53	59	26.49	30.04	+ .05	60.0	+ 4.2	91	6	74	37	18	46	39	46	33	41	0.49	− 0.3	5	4,005	se.	19	sw.	22	18	5	7	3.2	
Boise	2,739	61	68	27.17	30.00	+ .03	64.8	+ 4.0	96	7	80	42	28	49	45	50	38	44	0.38	0.0	3	2,176	nw.	20	sw.	22	20	6	4	2.9	
Lewiston	757	10	51	29.20	30.00	+ .02	65.6	+ 3.3	94	6	81	42	19	50	41	......	......	......	0.58	− 0.3	3	2,795	e.	36	nw.	9	22	4	4	2.3	
Pocatello	4,482	46	54	25.52	29.99	+ .03	62.2	+ 1.7	92	8	77	37	29	48	44	47	32	38	0.47	− 0.2	3	5,095	e.	26	sw.	25	18	10	2	2.7	
Spokane	1,929	101	110	27.99	30.03	+ .05	60.7	+ 2.6	91	6	76	37	13	45	42	48	36	47	0.14	− 0.9	1	2,928	ne.	24	sw.	16	11	10	6	3.8	
Walla Walla	1,000	71	79	28.94	30.00	.00	67.2	+ 3.3	95	5	80	44	10	54	36	55	45	48	0.26	− 0.7	4	3,189	s.	18	sw.	17	22	8	0	2.6	
N. Pac. Coast Reg.							58.5	+ 1.2										77	0.58	− 2.3										4.6	
North Head	211	11	56	29.84	30.07	+ .04	54.6	− 2.4	75	13	59	46	11	50	22	52	51	90	0.37	− 3.3	6	9,943	nw.	48	se.	27	8	8	14	5.8	
Port Crescent	259	12	29	29.78	30.06	+ .04	53.2	+ 0.4	78	3	63	35	20	44	37	......	......	......	0.24	− 3.2	3	3,502	w.	13	se.	12	13	10	7	4.2	
Seattle	123	114	151	29.94	30.08	+ .07	61.0	+ 2.6	84	7	70	44	19	52	29	54	50	72	0.22	− 1.6	3	2,638	n.	16	nw.	15	18	6	6	3.7	
Tacoma	213	113	120	29.82	30.04	+ .02	60.2	+ 4.0	86	7	70	41	20	50	32	......	......	......	0.40	− 1.8	4	2,893	n.	24	ne.	23	15	6	9	4.9	
Tatoosh Island	86	7	57	29.97	30.06	+ .05	53.2	− 0.6	64	13	58	43	15	49	16	51	50	93	2.16	− 4.4	6	8,029	sw.	36	e.	24	9	4	17	6.5	
Portland, Oreg	154	68	96	29.86	30.02	− .01	63.6	+ 2.9	87	3	75	42	19	52	31	56	50	67	0.28	− 1.5	7	3,271	nw.	16	nw.	8	15	7	8	4.2	
Roseburg	518	56	60	29.46	30.02	.00	62.4	+ 1.5	90	3	76	39	19	49	40	54	47	65	0.42	− 0.6	4	1,729	nw.	14	n.	8	22	3	5	2.6	
Mid. Pac. Coast Reg.							65.0	+ 2.1										63	3.66	+ 2.9										4.0	
Eureka	62	62	80	29.96	30.03	+ .02	54.6	+ 0.2	69	29	59	46	6	50	17	52	50	89	1.36	0.0	4	2,956	n.	20	n.	27	7	7	16	6.4	
Mount Tamalpais	2,375	11	18	27.54	29.97	+ .03	68.6	......	98	7	76	45	25	62	24	53	40	48	2.36	......	5	10,398	nw.	48	nw.	6	18	6	6	2.9	
Red Bluff	332	50	56	29.56	29.90	− .03	75.1	+ 1.3	106	6	88	50	26	62	38	59	47	46	4.86	+ 4.2	5	3,126	se.	24	se.	22	22	4	4	2.2	
Sacramento	69	106	117	29.84	29.91	+ .02	71.7	+ 2.2	102	7	84	53	27	60	35	60	53	55	3.62	+ 3.3	5	5,645	s.	36	se.	22	23	3	4	2.4	
San Francisco	155	161	167	29.81	29.98	+ .04	64.0	+ 3.6	101	8	71	49	5	57	41	57	54	79	5.07	+ 4.8	5	7,141	w.	36	w.	3	19	2	9	3.9	
Point Reyes Light	490	7	50	......	......	......	59.7	+ 3.1	98	8	66	48	*	54	40	......	......	......	3.40	+ 2.4	5	11,476	nw.	72	s.	23	8	5	17	6.5	
Southeast Farallon	30	9	17	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	......	
S. Pac. Coast Reg.							71.1	+ 2.8										67	1.40	+ 1.3										2.7	
Fresno	330	67	70	29.55	29.90	+ .03	75.2	+ 0.7	108	7	90	52	26	61	41	59	45	44	1.78	+ 1.6	4	3,903	nw.	20	nw.	9	23	1	6	2.7	
Los Angeles	338	116	123	29.58	29.94	+ .06	72.2	+ 3.7	97	4	83	51	27	62	32	62	58	70	0.28	− 0.2	2	3,994	w.	24	sw.	26	18	11	1	2.8	
San Diego	87	94	102	29.83	29.92	+ .03	70.2	+ 3.2	86	4	76	56	27	64	24	64	62	78	T.	− 0.1	0	4,132	nw.	20	nw.	4	23	5	2	2.1	
San Luis Obispo	201	47	54	29.74	29.95	+ .02	66.8	+ 3.4	106	7	79	48	19	55	54	59	55	77	3.54	+ 3.4	5	3,143	nw.	22	se.	23	21	2	7	3.3	
West Indies.																															
Basseterre	29	41	54	29.92	29.95	+ .01	79.8	......	87	2	84	71	4	75	12	75	73	79	7.43	......	18	6,982	e.	32	se.	4	1	14	15	7.4	
Bridgetown	30	57	65	29.89	29.92	+ .01	80.3	+ 1.6	88	2	86	72	13	75	14	76	74	81	5.97	− 0.9	21	5,198	e.	24	e.	20	12	8	10	5.3	
Cienfuegos	52	62	67	29.89	29.94	+ .03	80.2	......	92	12	89	69	19	72	21	76	72	84	7.51	......	21	4,401	ne.	25	ne.	2	8	20	2	4.8	
Grand Turk	11	6	20	29.96	29.97	+ .02	81.8	......	90	2	88	66	6	75	19	......	......	......	3.14	......	13	......	e.	......	......	......	12	10	8	5.6	
Havana	57	87	105	29.90	29.96	+ .05	79.7	− 1.0	88	4	85	71	18	74	15	......	......	......	1.88	− 4.8	13	6,670	e.	30	ne.	29	17	10	3	3.5	
Puerto Principe	352	55	62	29.61	29.96	+ .05	79.2	......	92	11	88	66	21	70	23	74	72	89	4.79	......	11	4,649	ne.	27	e.	5	8	20	2	4.1	
San Juan	82	48	90	29.87	29.96	+ .02	79.6	− 1.4	88	8	85	71	4	74	14	75	73	81	6.06	+ 0.9	21	7,799	e.	32	ne.	3	5	14	11	5.4	
Santiago de Cuba	82	46	52	29.85	29.93	+ .03	79.4	......	92	4	88	69	16	71	20	75	73	81	4.18	......	20	3,952	n.	30	ne.	14	3	17	10	6.5	

TABLE II.—*Climatological record of voluntary and other cooperating observers, September, 1904.*

Stations.	Temperature. (Fahrenheit.) Maximum.	Temperature. Minimum.	Temperature. Mean.	Precipitation. Rain and melted snow.	Precipitation. Total depth of snow.
	°	°	°	Ins.	Ins.
Alabama.					
Anniston	95	48	76.0	3.24	
Ashville	96	40	73.1	0.48	
Benton				2.32	
Bermuda	100	57	78.8	2.78	
Boligee	101	47	78.4	0.12	
Bridgeport				1.05	
Burkeville				0.35	
Calera				0.10	
Camphill	103	55[m]	77.9[e]	0.85	
Cedar Bluff				1.65	
Citronelle	98	64	79.9	4.86	
Clanton	100	49	76.1	0.00	
Cordova	98	41	74.6	1.62	
Dadeville				0.50	
Daphne	96	65	80.1	5.11	
Decatur	95	47	76.0	1.60	
Delmar	98	50	76.6	0.55	
Demopolis				0.26	
Eufaula	95	60	76.5	1.31	
Evergreen [1]	98	60	78.9	0.05	
Florence *a*				3.20	
Florence *b*	97	41	75.9	2.67	
Fort Deposit	96	60	78.6	1.99	
Gadsden	100	48	76.5	1.76	
Goodwater	97	50	75.4	0.05	
Greensboro	97	57	78.4	0.72	
Greenville				1.40	
Hamilton	99	40	76.0	1.51	
Highland Home	96	61	78.4	0.74	
Letohatchie				1.50	
Livingston	95	51	77.2	0.68	
Lock No. 4	98	46	76.1	0.35	
Madison Station	100	44	76.9	2.29	
Maplegrove	98	42	74.2	0.38	
Marion	98	58	79.2	1.13	
Milstead				1.16	
Newbern	104	51	79.6	0.36	
Notasulga				0.00	
Oneonto	97	41	73.0	1.01	
Opelika	91	60	76.5	0.09	
Ozark	97	62	78.6	0.33	
Prattville	97	50	75.8	1.75	
Pushmataha	96	51	77.0	0.69	
Riverton	96	41	74.8	2.61	
Scottsboro	96	41	72.8	1.37	
Selma	102	55	80.5	0.57	
Spring Hill	92[d]	67[e]	78.2[e]	3.70	
Talladega	101	46	77.2	0.86	
Tallassee				2.19	
Thomasville	99	60	79.2	1.70	
Tuscaloosa	99	49	77.9	0.38	
Tuscumbia	94	45	75.8	2.99	
Tuskegee	102	60	80.1	0.78	
Union Springs	95	59	77.2	0.35	
Uniontown	101	50	77.4	0.68	
Valleyhead	97	40	73.4	1.08	
Verbena				0.00	
Wetumpka	100	52	78.2	0.70	
Alaska.					
Juneau	68	32	49.4	9.20	
Killisnoo	65	32	47.8	7.70	
Orca	84	32	48.4	9.12	
Petersburg	64	30	48.9	15.33	
Sitka	71	36	50.6	13.27	
Arizona.					
Agua Caliente	104[d]	58[d]	84.2[d]	0.67	
Allaire Ranch				0.21	
Arizona Canal Co. Dam	103	50	82.0	0.16	
Aztec	112	47	79.7	0.75	
Benson		42		0.81	
Bisbee	86	45	67.6	0.43	
Blue	87	34	62.9	2.31	
Bowie	97	30	71.1	0.00	
Buckeye	106	45	79.6		
Cochise *[1]	94	50	69.5	0.25	
Congress	95	56	77.6	0.51	
Douglas	97	40	73.0	0.92	
Dragoon *[1]	91	63	73.6	0.00	
Dudleyville	96	44	75.0	1.39	
Duncan	103	42	69.0	T.	
Fort Apache	90	28	65.0	0.80	
Fort Defiance	78	28	56.8	0.55	
Fort Grant	104	52	78.6	0.65	
Fort Huachuca	88	43	68.2	0.92	
Fort Monave	110	52	82.8	0.16	
Gilabend	108	54	85.0	0.60	
Grand Canyon	90	42	65.2	1.70	
Greaterville	86	40	66.8	0.76	
Greer				0.25	
Holbrook	90	32	67.4	T.	
Jerome	90	48	71.6	0.20	
Kingman	96	44	71.8	0.25	
Maricopa	102	47	80.4	T.	
Mesa	101	46	79.7	0.50	
Mohawk Summit *[1]	110	75	87.1	0.40	
Natural Bridge				6.78	
Oracle	87	47	71.8	1.21	
Oro				0.52	

Stations.	Temperature. (Fahrenheit.) Maximum.	Temperature. Minimum.	Temperature. Mean.	Precipitation. Rain and melted snow.	Precipitation. Total depth of snow.
	°	°	°	Ins.	Ins.
Arizona—Cont'd.					
Parker	112	41	82.8	0.06	
Phoenix	105	47	79.1	1.20	
Pinal Ranch				2.39	
St. Johns	87	32	64.3	0.50	
San Carlos	101	42	77.2	0.21	
San Simon	92	40	74.6	0.00	
Sentinel *[1]	100	65	82.6	0.00	
Signal	108	47	79.2	0.91	
Superstition				0.84	
Taylor	85	31	65.8	1.24	
Thatcher	96[e]	36[i]	73.0[f]	2.01	
Tombstone	89	45	70.0	0.23	
Tuba	86	32	62.8	0.20	
Tucson	97	44	77.0	0.89	
Upper San Pedro	94	32	71.2	0.00	
Vail *[5]	97	64	75.2	0.04	
Walnutgrove				0.13	
Wilcox	92	35	70.0	0.85	
Williams	85	28	59.6	0.90	
Yarnell				0.32	
Young	97	32	70.4	0.82	
Arkansas.					
Alco	95	51	74.7	3.20	
Amity	96	47	74.6	2.56	
Arkadelphia	98	49	76.6	3.83	
Arkansas City				0.80	
Batesville	96	46	73.0	0.70	
Beebranch	97[d]	44[d]	73.5[d]	3.15	
Blanchard	96	50	77.0	0.16	
Brinkley	98	44	75.6	1.26	
Calico Rock				2.20	
Camden *a*				5.34	
Camden *b*	95	54	77.4	3.82	
Conway	96	44	76.1	1.86	
Corning	93	43	71.4	3.96	
Dallas	97	50	76.6	2.01	
Dardanelle				1.06	
Des Arc	97	45	76.0	1.00	
Dodd City	95	39	72.0	2.30	
Dutton	89	38	69.4	5.34	
Elon	97[e]	54[e]	77.6[e]	3.05	
Eureka Springs	92	42	72.6	1.96	
Forrest City	94	50	75.8	1.02	
Fulton				3.40	
Hardy	98	43	74.4	2.25	
Heber	101	41	78.6	2.34	
Helena *a*				1.50	
Helena *b*	95	48	75.8	1.44	
Hope	98	53	78.6	1.63	
Howe	100	52	79.0	2.94	
Jonesboro	100	45	77.0	1.40	
Lacrosse	100	45	73.4	3.80	
Lake Village	97	52	77.0	0.62	
Lonoke	99[e]	45[b]	77.2[e]	0.90	
Lutherville	98	42	72.6	4.88	
Malvern	100	48	77.6	1.30	
Mammoth Springs	94	44	71.6	1.44	
Marked Tree				0.47	
Marvell	97	45	76.8	1.71	
Mossville	90	43	71.0	3.14	
Mount Nebo	89	59	74.8	4.23	
New Gascony	96[e]	44[e]	77.6[e]	4.70	
Lewisville	99	52	78.5	2.20	
Newport *a*				0.52	
Newport *b*	100	47	76.4	0.62	
Oregon	94	37	69.2	3.14	
Osceola	98	48	75.4	2.25	
Ozark	99	50	76.8	4.44	
Perry	94	45	74.8	3.43	
Pinebluff	99	46	76.4	2.84	
Pocahontas	97	43	73.3	2.75	
Pond	91	40	72.2	1.57	
Prescott	95	55	77.4	5.17	
Princeton	97	43	75.8	4.00	
Rison	98	43	74.6	2.52	
Russellville	94	45	73.4	6.18	
Silversprings	92	39	72.4	2.96	
Spielerville	98	48	75.6	2.50	
Stuttgart	98	41	75.9	3.90	
Texarkana	95	54	77.4	3.56	
Warren	101	46	78.0	2.99	
Wiggs	98	48	74.7	3.66	
Winchester	98	47	77.4	3.28	
Witts Springs	90	40	70.7	2.80	
California.					
Alturas				0.57	
Azusa	104	45	73.4	0.12	
Bagdad	103	58	82.1	0.00	
Bakersfield	111	50	75.5	0.88	
Barstow	105	40	72.9	0.00	
Bear Valley				5.27	
Berkeley	99	48	63.4	4.44	
Bishop	96	36	64.6	1.67	
Blue Canyon	86	35	61.1	4.57	
Boca *[1]	83	32	55.0	1.10	
Bodie	81	15	46.8	2.38	11.0
Bowman				5.73	
Branscomb	98	38	65.4	2.96	

Stations.	Temperature. (Fahrenheit.) Maximum.	Temperature. Minimum.	Temperature. Mean.	Precipitation. Rain and melted snow.	Precipitation. Total depth of snow.
	°	°	°	Ins.	Ins.
California—Cont'd.					
Brush Creek	102	40	65.6	6.63	
Butte Valley				5.50	5.0
Caliente *[1]	110	57	77.6	0.00	
Campbell	105	46	66.8	2.94	
Campo				0.64	
Cedarville	95	32	62.6	0.57	
Chico	104	51	73.8	3.38	
Chino *[5]	103	50	75.8	0.00	
Cisco *[1]	80	30	60.1	7.74	2.0
Claremont	107	45	74.6	0.02	
Cloverdale	110	45	69.8	4.21	
Colusa	101	52	72.2	2.88	
Corning *[1]	105	52	71.6	5.15	
Coronado				0.00	
Crescent City	79	42	55.4	2.48	
Crockers				6.51	
Cuyamaca	81	34	57.1	0.15	
Delano *[1]	110	59	79.4	1.61	
Delta	103	49	75.6	6.90	
Dobbins	106	48	76.1	4.85	
Drytown	105	48	71.8	3.10	
Dunnigan *[1]	105	57	75.1	4.00	
Durham	100	52	74.9	3.90	
Elcajon	102	56	78.6	T.	
Elmdale	113	46	74.0	1.10	
Elsinore	110	42	74.2	0.82	
Folsom				3.29	
Fordyce				5.95	
Fort Bragg				2.55	
Fort Ross	89	43	60.4	4.21	
Foster				0.00	
Georgetown	99	43	69.3	5.49	
Gilroy (near)	111	45	68.1	1.02	
Greenville	98	36	62.3	5.04	
Hanford	105	49	73.8	2.48	
Healdsburg	113	41	69.9	4.50	
Hollister	111	44	67.4	1.12	
Idylwild	90	32	65.0	T.	
Imperial	112	53	83.2	0.03	
Iowa Hill *[1]	93	48	68.6	4.97	
Irvine				0.02	
Isabella	104	41	70.6	0.77	
Jamestown	102	44	69.1	2.68	
Jalon				3.32	
Kennedy Gold Mine				2.71	
Kentfield				5.57	
Kernville				0.79	
Laguna Valley				0.21	
Laporte	83	33	58.4	7.34	T.
Legrande	108	50	74.1	1.61	
Lemoncove	112	52	76.2	2.43	
Lick Observatory	86	40	65.0	2.33	
Livermore	108	48	71.4	1.62	
Lodi	105	47	70.4	2.29	
Los Gatos	101	44	66.8	5.97	
Magalia	101	44	70.1	5.50	
Mammoth	107	53	85.8	0.00	
Marysville	109	47	70.9	2.57	
Merced	110	50	76.9	1.80	
Mercury				3.45	
Mills College				3.82	
Milo				2.20	
Milton (near)	105	52	73.8	1.82	
Modesto *[1]	108	56	76.6	1.68	
Mohave	104	47	79.0	0.00	
Mokelumne Hill				2.87	
Montague	99	40	65.9	1.06	
Monterio	96	42	69.8	0.78	
Monterey *[1]	98	50	62.2	2.75	
Mount St. Helena				6.95	
Napa	110	48	68.8	4.79	
Needles	106	61	85.4	0.04	
Nellie				T.	
Nevada City	97	39	65.2	4.74	
Newman	108	50	75.0	1.13	
Niles	102	48	67.5	2.80	
Nordhoff				6.14	
North Bloomfield	98	39	66.7	6.27	
Oakland	99	52	65.2	4.50	
Ontario (near)	106	45	73.7	T.	
Orland	110	52	76.3	3.03	
Orleans	107	49	71.0	1.19	
Oroville (near)	107	53	74.0	3.65	
Palermo	108	50	72.8	3.21	
Peachland *[5]	106	46	65.2	4.19	
Pilot Creek				5.90	
Pine Crest	98	52	69.4	10.95	
Pino Grande	87	40	61.0	5.29	
Placerville	96	40	65.8	4.09	
Point Lobos	92	56	64.8	4.27	
Porterville	110	44	75.9	1.64	
Poway				T.	
Quincy	92	39	60.4	5.18	
Redding	101	48	74.2	4.25	
Reedley	108	48	72.7	3.72	
Represa	100	52	71.0	3.10	
Riovista	104	53	72.0	2.91	
Riverside	110	42	72.2	T.	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
California—Cont'd.					
Rohnerville	....	....	....	1.14	
Rosewood	104	45	71.8	5.21	
Sacramento	98	51	68.2	4.24	
Salinas	110	45	66.2	1.14	
Salton	110	60	84.7	0.00	
San Bernardino	110	41	73.6	0.06	
San Jacinto	90	43	64.0	0.00	
San Jose	106	48	68.6	1.94	
San Leandro	102	50	65.4	2.95	
San Mateo*[1]	102	48	71.0	3.97	
San Miguel*[1]	107	51	71.8	2.37	
San Miguel Island	....	....	....	3.20	
San Rafael	110	46	67.4	6.12	
Santa Barbara	91	53	69.2	7.15	
Santa Clara College	109	45	67.6	3.01	
Santa Cruz	108	44	64.1	4.70	
Santa Maria	95	50	67.2	2.55	
Santa Monica	94	54	68.8	0.27	
Santa Rosa	108	42	66.4	4.39	
Sausalito	....	....	....	4.81	
Shasta	107	46	76.0	6.82	
Sierra Madre	99	50	72.0	0.26	
Sisson	95	31	60.5	5.24	
Snedden	....	....	....	1.90	
Sonoma	....	....	....	4.10	
Stockton	104	52	70.9	2.33	
Storey	109	48	72.9	....	
Summerdale	90	33	61.2	8.52	
Summit	76	36	62.8	4.56	3.0
Susanville	89	35	59.9	0.90	
Tehama*[1]	103	54	73.2	4.17	
Tejon Ranch	102	50	75.7	0.44	
Truckee	84	38	58.2	2.14	
Tulare c	106	50	73.3	1.58	
Tustin	....	....	....	0.03	
Ukiah	108	45	69.3	2.87	
Upland	101	44	70.4	0.00	
Upperlake	106	39	68.5	2.42	
Vacaville*[1]	109	54	73.6	5.10	
Ventura	90	54	68.0	1.89	
Visalia	110	48	72.6	1.38	
Volcano	110	58	86.1	0.00	
Wasco	108	50	76.8	1.45	
Westpoint	....	....	....	5.09	
Wheatland	104	50	71.6	2.88	
Willow	104	55	78.4	3.35	
Yosemite	....	....	....	7.09	
Zenia	93	37	64.9	2.04	
Colorado.					
Akron	....	....	....	2.37	
Alford	86	25	55.8	1.00	
Antelope Springs	72	21	46.2	3.56	1.0
Ashcroft	75	26	48.1	1.69	
Blaine	96	41	67.4	3.21	
Boulder	92	38	64.4	1.60	
Boxelder	....	....	....	1.20	
Breckenridge	73	27	47.9	1.72	
Burlington	93	33	64.4	3.43	
Canyon	90	40	64.2	1.53	
Cheesman	87	34	58.8	1.87	
Cheyenne Wells	92	32	64.8	4.51	
Clearview	68	31	49.0	4.45	
Collbran	89	28	61.6	1.71	
Colorado Springs	83	39	60.4	2.07	
Cripplecreek	....	....	....	1.65	
Delta	90[b]	36[a]	61.2[e]	0.33	
Durango	85	27	60.2	2.14	
Eagle	86	29	54.7	1.15	
Fort Collins	90	30	59.2	1.09	
Fort Morgan	89	35	62.2	1.44	
Fowler	....	....	....	2.41	
Fox	94	32	63.8	2.18	
Fruita	92	32	64.5	0.70	
Garnett	79	25	53.2	1.95	
Gilman	....	....	....	2.12	
Gleneyre	84	34	59.2	2.52	
Greeley	94	35	62.5	1.25	
Grover	....	....	....	1.30	
Gunnison	79	24	52.6	1.10	
Halls Gulch	62	23	41.2	1.88	0.5
Hamps	83	33	58.8	2.37	
Hoehne	90	33	61.2	5.87	
Holly	94	37	68.0	2.27	
Husted	84	31	56.8	2.09	
Lake Moraine	65	23	43.6	3.00	
Lamar	96	41	68.9	2.59	
Laporte	....	....	....	1.11	
Las Animas	94	37	65.6	1.95	
Lay	87	22	54.4	0.81	
Leadville (near)	69	30	48.8	1.26	
Leroy	95	28	63.6	2.96	
Longs Peak	73	22	50.3	2.98	
Lost Canon	58	18	37.1	0.86	13.5
Mancos	82	26	57.8	1.10	
Marshall Pass	86	30	56.7	1.26	
Meeker	84	24	54.4	1.21	
Pagoda	86	26	56.3	0.96	
Parachute	92	38	62.1	1.09	
Colorado—Cont'd.					
Platte Canon	....	....	....	1.64	
Rockyford	94	40	66.0	2.34	
Saguache	80	36	57.3	1.47	
Salida	84	32	57.3	2.72	
San Luis	82	32	55.1	1.15	
Santa Clara	80	33	57.2	5.00	
Sapinero	78	25	52.6	1.75	
Sheridan Lake	94	33	66.6	1.59	
Silt	86	35	60.8	1.19	
Silverton	74	24	48.0	2.88	
Sugar City	....	44	....	2.09	
Trinidad	83	45	63.0	6.78	
Victor	74	36	53.4	1.90	0.5
Vilas	....	....	....	3.05	
Wagon Wheel	73	26	49.2	3.20	
Walden	77	21	49.3	0.83	
Wallet	....	....	....	4.35	
Waterdale	90	32	60.0	1.07	
Westcliffe	78	32	55.2	2.75	
Whitepine	72	29	48.2	2.16	
Wray	97	29	67.6	1.74	
Yuma	....	....	....	2.92	
Connecticut.					
Bridgeport	84	33	63.4	5.16	
Canton	82	24	58.9	6.92	
Colchester	80	28	61.2	6.40	
Falls Village	....	....	....	7.44	
Hartford b	80	32	60.4	6.18	
Hawleyville	82	27	61.0	7.26	
Lake Konomoc	....	....	....	4.39	
New London	82	34	62.6	5.00	
North Grosvenor Dale	83	26	60.4	6.72	
Norwalk	83	28	61.8	4.46	
Southington	82	28	61.3	6.90	
South Manchester	....	....	....	4.28	
Storrs	80	29	60.0	4.71	
Voluntown	83	24	61.6	5.60	
Wallingford	....	....	....	6.05	
Waterbury	86	26	62.0	8.02	
West Cornwall	82	27	62.4	7.92	
West Simsbury	....	....	....	5.29	
Delaware.					
Delaware City	....	....	....	6.15	
Milford	93	35	69.2	1.72	
Millsboro	95	34	68.4	2.58	
Newark	86	33	65.8	3.51	
Seaford	90	35	66.6	2.08	
District of Columbia.					
Distributing Reservoir*[5]	83	45	69.1	3.71	
Receiving Reservoir*[5]	84	42	68.3	3.80	
West Washington	92	36	68.7	5.93	
Florida.					
Apalachicola	96	70	80.1	1.87	
Archer	92	60	77.6	3.19	
Avon Park	95	65	80.2	5.39	
Bartow	93	62	80.0	1.76	
Bonifay	98	64	79.8	1.15	
Brooksville	96	61	79.8	4.60	
Clermont	102	66	81.4	5.00	
De Funiak Springs	98	64	79.0	1.44	
Eustis	96	62	79.8	5.79	
Federal Point	93	63	78.6	4.04	
Fernandino	95[g]	67[g]	79.2[g]	5.59[g]	
Fort Meade	96	62	80.3	5.64	
Fort Pierce	89	68	79.8	6.42	
Gainesville	94	64	79.2	4.95	
Grasmere	91	64	79.2	....	
Hypoluxo	90	69	80.7	6.97	
Inverness	97	50	75.8	3.78	
Jasper	96	61	77.1	3.68	
Johnstown	94	57	77.1	6.27	
Kissimmee	93	65	79.1	4.66	
Lake City	95[e]	60[e]	77.6[e]	2.00[e]	
Macclenny	99	55	78.4	6.16	
Madison	97	63	78.8	0.79	
Malabar	93[j]	69[j]	80.2[j]	6.63[j]	
Manatee	93	66	79.6	7.60	
Marco	93	72	81.8	5.44	
Marianna	102	61	79.4	2.18	
Merritt Island	91	71	81.0	5.61	
Miami	91	70	81.2	8.76	
Micanopy	99	60	79.6	4.21	
Middleburg	97	57	76.7	6.33	
Molino	102	60	79.6	2.44	
Monticello	98	60	78.4	2.19	
Myers	90	69	79.2	3.07	
New Smyrna	94	64	78.2	4.61	
Ocala	96	63	79.4	7.10	
Orange City	101	60	80.4	6.38	
Orange Home	96	62	80.2	4.75	
Orlando	98	63	80.8	5.00	
Pinemount	99[e]	58[e]	78.1[e]	1.56	
Plant City	96	62	80.1	4.95	
Rockwell	....	....	....	5.13	
St. Andrews	93	64	78.8	1.93	
St. Augustine	94	64	79.5	5.80	
St. Leo	94	65	79.4	3.46	
Stephensville	95	55	78.0	5.28	
Florida—Cont'd.					
Sumner	94	59	78.5	1.32	
Switzerland	94	61	77.9	6.92	
Tallahassee	....	....	....	2.97	
Tarpon Springs	93	63	79.3	6.26	
Titusville	97	63	80.4	6.70	
Wausau	101	63	80.0	0.84	
Wewahitchka	98	63	79.8	1.82	
Georgia.					
Abbeville	....	....	....	1.05	
Adairsville	92	48	74.3	0.20	
Albany	100	66	82.4	0.32	
Allapaha	95	58	77.4	2.34	
Americus	94	57	76.4	0.02	
Athens	91	52	73.5	1.05	
Bainbridge	95	63	77.9	4.28	
Blakely	101	60	80.2	0.10	
Bowersville	95	49	75.0	1.25	
Butler	....	....	....	0.57	
Camak	100	50	77.2	3.85	
Carrollton	99	49	74.8	T.	
Canton	....	....	....	0.56	
Carlton	....	....	....	0.93	
Clayton	88	50	70.0	0.70	
Columbus	100	62	79.7	0.09	
Covington	97	53	76.4	T.	
Cordele	98	57	78.0	2.87	
Dahlonega	91	48	70.6	0.51	
Dawson	99	58	79.6	0.50	
Diamond	90	44	68.2	1.58	
Dublin	....	....	....	1.56	
Dudley	101	61	79.0	0.59	
Eastman	98	56	79.0	0.60	
Eatonton	97	53	77.2	....	
Elberton	94	50	74.8	1.36	
Experiment	94	54	76.3	0.11	
Fitzgerald	99	55	78.0	3.44	
Fleming	97	57	77.4	4.62	
Forsyth	98	51	77.0	0.50	
Fort Gaines	95	62	76.9	0.80	
Gainesville	91	51	72.8	0.34	
Gillsville	94	50	73.8	0.88	
Greenbush	94	46	73.3	0.31	
Greensboro	97	52	75.9	2.35	
Griffin	96	53	77.0	0.42	
Harrison	96	55	76.2	1.18	
Hawkinsville	100	56	78.2	0.45	
Lost Mountain	95	52	74.6	0.25	
Louisville	92	54	74.7	0.43	
Lumpkin	104	59	79.2	1.09	
Marshallville	95	58	77.8	0.03	
Mauzy	99	58	78.4	3.76	
Milledgeville	96	54	77.1	T.	
Millen	98	50	77.0	1.33	
Monticello	99	52	77.4	0.49	
Morgan	97	60	78.1	0.87	
Newnan	98	53	75.8	0.05	
Oakdale	....	....	....	0.22	
Point Peter	95	49	73.0	1.17	
Poulan	97	56	77.4	0.97	
Putnam	99	57	78.0	0.56	
Quitman	96	60	77.5	3.36	
Ramsey	95	45	74.6	0.97	
Resaca	....	....	....	0.38	
Rome	98	46	74.2	1.64	
St. Marys	97	61	78.0	9.55	
Talbotton	99	58	76.5	0.19	
Tallapoosa	97	45	72.9	0.07	
Thomasville	97	59	78.8	1.34	
Toccoa	97[e]	46[e]	72.1[e]	1.46	
Vidalia	100	58	78.4	4.02	
Valona	94	61	76.8	4.66	
Washington	91	52	74.1	0.33	
Waverly	97	58	77.8	4.04	
Waycross	97	60	79.3	3.04	
Waynesboro	96	54	75.2	0.96	
Westpoint	101	53	78.1	0.30	
Woodbury	95	51	74.4	0.73	
Idaho.					
Albion	88	29	58.2	0.72	
American Falls	95	31	60.5	0.45	
Blue Lakes	101	41	67.2	0.34	
Burnside	87	35	59.0	0.50	
Cambridge	98	32	62.6	0.44	
Chesterfield	89	21	53.6	0.15	
Dewey	89	30	56.0	0.54	
Ditto Creek	....	....	....	0.28	
Driggs	88[e]	28[e]	55.4[e]	0.89	
Forney	88	22	53.1	0.19	
Garnet	104	41	68.9	0.03	
Grangeville	90	37	60.8	0.51	
Hailey	92	32	60.8	0.24	
Idaho City	98[e]	31[e]	60.1[e]	0.46	
Lakeview	86	36	56.4	0.10	
Landore	....	....	....	0.31	
Lost River	90	34	58.4	0.77	
Lovell	95	23	57.8	0.12	
Malad	97[g]	32[g]	26.1[g]	T.	
Meadows	91	25	55.2	0.62	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Idaho—Cont'd.	°	°	°	*Ins.*	*Ins.*
Milner	99	36	64.0	0.29	
Moscow	90	33	61.0	0.38	
Murray	87	26	58.2	0.25	
Oakley	94	35	61.2	0.90	
Ola	95	36	62.4	0.59	
Orofino	97	33	61.8	0.40	
Payette	96	37	64.8	0.10	
Pollock	95	40	63.9	0.03	
Poplar	.....	.....	.....	0.29	
Porthill	86	31	55.2	0.22	
Riddle	90	26	58.6	0.51	
Roosevelt	78	29	52.5	0.45	
St. Maries	96	29	58.1	0.09	
Soldier	90	24	57.6	0.02	
Swan Valley	89	24	55.0	0.12	
Vernon	90	32	57.2	T.	
Weston	92	30	59.6	0.56	
Illinois.					
Aledo	87	38	65.0	3.62	
Alexander	91	38	68.0	3.86	
Antioch	88	35	62.6	4.55	
Ashton	86	34	62.6	3.98	
Astoria	87	37	65.4	5.33	
Aurora	87	35	63.0	5.05	
Benton	93	43	72.8	5.75	
Bloomington	92	39	68.0	5.65	
Bushnell	91	41	67.8	2.89	
Cambridge	88	42	66.3	5.83	
Carlinville	91	39	66.7	4.11	
Carrollton	92	40	69.6	6.95	
Charleston	90	41	68.8	5.80	
Chester	.....	.....	.....	7.42	
Cisne	93	42	70.7	6.04	
Coatsburg	87	41	67.0	8.38	
Cobden	94	43	72.0	9.11	
Danville	91	41	67.6	2.72	
Decatur	93	39	68.0	9.48	
Dixon	90	34	64.0	5.46	
Effingham	90	39	67.5	3.98	
Equality	99	43	72.6	8.85	
Fandon	88	39	67.0	3.27	
Flora	88[f]	40[f]	68.0[f]	6.26	
Friendgrove	89	44	69.2	6.91	
Galva	89	38	64.3	5.49	
Grafton	.....	.....	.....	4.18	
Greenville	93	44	69.6	5.04	
Griggsville	92	44	69.3	6.26	
Halfway	88	46	70.8	5.55	
Hallidayboro	.....	.....	.....	4.10	
Havana	98	37	68.2	3.02	
Henry	89	36	66.0	3.66	
Hillsboro	92	40	69.0	5.44	
Hoopeston	90	40	66.3	3.91	
Joliet	89	40	64.6	4.95	
Kishwaukee	89	37	64.0	3.52	
Knoxville	88	37	64.7	5.54	
Lagrange	89	39	63.7	3.69	
Laharpe	92	35	67.2	8.15	
Lanark	89	32	63.2	7.49	
Loami	.....	.....	.....	3.47	
McLeansboro	92	44	70.4	10.11	
Martinsville	90	40	67.3	5.01	
Martinton	92	38	65.2	4.81	
Mascoutah	91	41	68.7	4.25	
Mattoon	88	46	71.8	4.51	
Minonk	89	36	65.4	4.14	
Monmouth	91	36	65.8	4.29	
Morrison	88	35	64.2	3.19	
Morrisonville	92	42	69.1	4.62	
Mount Carmel	.....	.....	.....	5.68	
Mount Pulaski	92	40	67.8	8.73	
Mount Vernon	98	45	70.6	4.22	
New Burnside	94	41	72.2	5.31	
Olney	92	43	70.2	6.13	
Ottawa	89	40	66.1	3.27	
Palestine	93	44	69.8	5.45	
Pana	92	42	67.8	4.26	
Paris	91	44	68.1	4.64	
Peoria *a*	.....	.....	.....	7.05	
Peoria *b*	92	43	68.4	6.67	
Philo	90	37	65.8	3.17	
Plumhill	90	41	69.4	6.83	
Pontiac	87	40	65.9	5.79	
Rantoul	90	41	65.8	3.39	
Raum	96	43	72.8	6.49	
Riley	87	37	62.8	4.79	
Robinson	90	43	68.9	5.21	
Rockford	.....	.....	.....	3.39	
Rushville	90	41	67.6	3.87	
St. Charles	88	34	63.2	4.42	
St. John	94	40	70.8	4.69	
Shobonier	92	41	68.8	3.98	
Streator	90	37	64.4	4.15	
Sullivan	92	41	67.8	4.03	
Sycamore	90	36	62.8	5.24	
Tilden	90	41	69.4	6.47	
Tiskilwa	92	40	65.4	3.40	
Tuscola	88	40	66.0	4.35	
Illinois—Cont'd.	°	°	°	*Ins.*	*Ins.*
Urbana	89	41	66.1	2.53	
Walnut	88[e]	38[e]	64.6[e]	3.96	
Warsaw	.....	.....	.....	8.11	
Winchester	88	40	67.4	7.06	
Windsor	90	39	67.4	4.13	
Winnebago	88	34	63.0	4.11	
Yorkville	88	36	63.6	3.82	
Zion	88	34	62.6	6.81	
Indiana.					
Anderson	88	42	66.1	2.90	
Angola	85	36	63.4	2.93	
Auburn	85	35	62.2	3.31	
Bloomington	90	42	68.6	4.84	
Bluffton	89	32	65.0	3.00	
Butlerville	93	38	69.0	2.64	
Cambridge City	90	36	64.5	3.73	
Columbus	94	39	69.0	4.41	
Connersville	92	39	66.3	3.11	
Crawfordsville	90	44	67.0	4.28	
Delphi	90	41	65.4	4.11	
Elkhart	87	38	64.9	2.43	
Farmland	86	41	64.6	2.67	
Fort Wayne	90	37	65.4	2.35	
Franklin	91	40	67.3	4.08	
Greencastle	87	44	66.6	3.03	
Greenfield	91	42	67.8	3.07	
Greensburg	93	37	67.8	2.40	
Hammond	89	40	63.2	2.77	
Hector	93	42	67.4	2.30	
Holland	94	41	71.6	2.95	
Huntington	88	39	64.6	3.56	
Jeffersonville	93	45	71.2	2.13	
Kokomo	88	41	64.6	2.72	
Lafayette	89	43	66.2	4.41	
Laporte	81	36	62.8	3.10	
Logansport	88	42	64.6	5.27	
Madison *a*	98	42	71.2	3.04	
Madison *b*	.....	.....	.....	2.72	
Marengo	94	38	69.0	3.80	
Marion	89	40	65.4	3.47	
Markle	91	37	65.4	2.80	
Mauzy	93[e]	38[e]	66.8[e]	3.21	
Moores Hill	95	42	68.7	2.01	
Mount Vernon	96	44	71.8	4.64	
Northfield	88	37	64.2	2.08	
Paoli	94	33	69.0	3.66	
Princeton	92	41	71.0	5.18	
Rensselaer	84	40	64.6	3.65	
Richmond	93	35	66.4	2.36	
Rochester	86	40	65.3	3.77	
Rockville	89	43	66.6	3.79	
Rome	99	37	72.6	4.92	
Salem	96	37	70.6	3.36	
Scottsburg	93	42	70.1	2.44	
Seymour	91	41	68.8	3.24	
South Bend	86	34	64.2	2.11	
Syracuse	86	37	65.0	3.34	
Terre Haute	90	46	70.0	3.74	
Topeka	85	37	67.3	2.08	
Valparaiso	87	39	66.2	3.19	
Veedersburg	92[e]	41[e]	67.8[e]	3.17	
Vevay	91	44	69.8	3.05	
Vincennes	94	43	70.8	4.39	
Washington	89	43	68.4	6.02	
Winamac	88	40	66.8	5.13	
Worthington	92	40	68.5	4.18	
Indian Territory.					
Ardmore	101	50	76.0	4.93	
Calvin	.....	.....	.....	2.51	
Chickasha	99	45	75.0	3.97	
Claremore	97	43	74.0	1.32	
Durant	100	59	76.2	2.62	
Fairland	95	39	73.9	1.60	
Fort Gibson	.....	.....	.....	1.79	
Goodwater	102	49	77.5	2.98	
Hartshorne	99	56	77.4	2.19	
Healdton	99	51	75.4	6.23	
Holdenville	97	44	75.2	2.58	
Marlow	99	48	73.4	4.37	
Muskogee	100	43	74.8	2.99	
Okmulgee	99	40	74.6	2.93	
Pauls Valley	97	42	73.8	2.05	
Ravia	100	51	76.8	5.54	
Roff	96	50	76.2	3.20	
South McAlester	101	47	78.4	3.80	
Tulsa	.....	.....	.....	1.37	
Vinita	96	38	74.9	1.91	
Wagoner	100	40	74.8	1.58	
Webbers Falls	98	38	73.4	2.76	
Iowa.					
Afton	86	35	65.2	2.80	
Albia	90	40	65.2	5.55	
Algona	86	35	61.6	2.07	
Allerton[j]	90	36	65.2	.....	
Alta	87	36	61.4	1.17	
Amana	88	33	64.5	1.74	
Ames	88	34	64.5	3.37	
Atlantic	89	30	64.0	3.06	
Iowa—Cont'd.	°	°	°	*Ins.*	*Ins.*
Audubon	91	31	63.6	2.22	
Baxter	88	36	64.2	2.45	
Bedford	87	33	65.6	4.40	
Belknap	89	41	68.6	5.61	
Belleplaine	88	35	63.4	2.53	
Bonaparte	90	35	66.0	6.73	
Britt	87	33	61.4	3.19	
Buckingham	.....	.....	.....	2.12	
Burlington	90	39	67.3	3.98	
Carroll	89	36	63.4	1.66	
Cedar Rapids	92	36	65.0	1.02	
Chariton	89	35	65.4	2.66	
Charles City	88	33	60.6	3.31	
Clarinda	91	34	65.0	1.39	
Clearlake	89	39	62.8	2.05	
Clinton	90	33	64.0	2.67	
College Springs	90	37	66.9	1.12	
Columbus Junction	87	37	65.2	4.61	
Corning	87	38	64.8	2.23	
Corydon	90	38	66.8	2.73	
Cresco	87	33	60.8	4.95	
Cumberland	.....	.....	.....	2.03	
Decorah	83	34	61.9	5.44	
Delaware	87	34	62.6	2.65	
Denison	91	37	64.2	1.53	
Desoto	89	37	66.0	1.78	
Dows	87	34	62.4	4.60	
Earlham	86	30	62.4	3.37	
Elkader	93	32	64.5	4.39	
Estherville	92	31	60.4	1.35	
Florence	.....	.....	.....	3.69	
Forest City	90	34	60.8	1.77	
Fort Dodge	88	40	62.2	4.02	
Fort Madison	.....	.....	.....	5.04	
Galva	89	33	60.9	1.07	
Gilman	.....	.....	.....	1.67	
Glenwood	90	39	66.1	3.15	
Grand Meadow	85	36	62.4	6.09	
Greene	88	34	62.7	3.39	
Greenfield	87	37	65.0	2.80	
Grinnell (near)	91	37	65.8	1.00	
Grundy Center	89	35	63.8	3.18	
Guthrie Center	88	36	65.2	1.64	
Hampton	91	37	64.2	4.24	
Hanlontown	88	30	60.9	1.55	
Harlan	89	34	63.6	2.48	
Hopeville	89	37	66.0	2.35	
Humboldt	87	37	63.2	2.00	
Ida Grove	88	37	64.1	0.09	
Independence	90	31	62.6	1.86	
Indianola	88	36	66.2	2.74	
Inwood	90	34	60.5	0.41	
Iowa City	91	35	64.3	3.12	
Iowa Falls	89	31	61.6	2.24	
Keosauqua	90	35	65.2	6.26	
Knoxville	89	38	66.3	4.00	
Lacona	.....	.....	.....	3.20	
Larrabee	89	35	62.0	0.97	
Leclaire	.....	.....	.....	3.65	
Lemars	91	35	62.0	0.85	
Lenox	86	38	65.2	2.44	
Leon	86	38	65.8	2.19	
Little Sioux	92	38	65.9	1.33	
Logan	92	34	65.5	2.55	
Maple Valley	.....	.....	.....	1.69	
Marshalltown	91	33	63.4	3.68	
Mason City	87	37	62.6	2.55	
Massena	88	32	65.0	2.72	
Montezuma	.....	.....	.....	1.57	
Mountayr	90	40	67.0	2.28	
Mount Pleasant	89	38	66.1	6.97	
Mount Vernon	88	35	64.7	1.78	
New Hampton	87	32	60.2	2.75	
Odebolt	91	33	63.8	1.17	
Ogden	88	40	63.6	3.51	
Olin	87	32	63.6	1.56	
Onawa	91	41	66.3	2.58	
Osage	85	34	61.1	4.16	
Osceola	90	35	65.2	2.87	
Oskaloosa	89	35	65.4	3.46	
Ottumwa	92	39	68.2	4.58	
Pacific Junction	91	38	66.4	2.43	
Perry	87[i]	37[i]	62.8[i]	2.25	
Plover	88	34	62.2	4.36	
Pocahontas	88	37	63.2	1.76	
Redoak	87	40	66.8	2.01	
Ridgeway	90	38	63.7	5.16	
Rock Rapids	88	30	60.1	0.60	
Rockwell City	90	38	62.2	1.75	
Sac City	89	37	63.7	1.47	
St. Charles	89	41	66.4	2.27	
Sheldon	92	32	62.4	1.58	
Sibley	89	31	59.0	2.70	
Sigourney	91	36	65.6	2.99	
Sioux Center	89	34	61.0	0.71	
Spirit Lake	89	36	61.3	1.03	
Stockport	88	38	66.0	7.08	
Storm Lake	86	34	60.4	0.99	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Iowa—Cont'd.	°	°	°	*Ins.*	*Ins.*
Stuart	87	38	65.8	2.34	
Thurman	89	37	66.5	1.52	
Tipton	90	39	66.4	3.02	
Toledo	93	31	64.5	1.65	
Vinton	91	33	65.3	1.30	
Wapello	89	40	67.6	4.24	
Washington	88	38	65.2	3.99	
Washta	......	......	......	2.11	
Waterloo	93	33	64.0	2.15	
Waukee	93	38	67.7	1.79	
Waverly	89	37	62.8	3.78	
Westbend	87	34	61.8	2.69	
Whitten[b]	89	38	65.4	......	
Wilton Junction	94	32	65.0	1.91	
Winterset	90	41	67.1	2.72	
Woodburn	......	......	......	2.77	
Zearing	89	38	64.3	2.35	
Kansas.					
Achilles	101	25	65.0	2.61	
Alton	100	36	68.3	2.09	
Anthony	......	......	......	1.13	
Atchison	91[d]	40[d]	69.2[d]	4.86	
Baker	96	40	68.6	2.58	
Burlington	96	36	71.8	1.41	
Chapman	95	42	71.0	2.51	
Clay Center	98	37	68.4	1.91	
Coffeyville	101	42	76.4	2.77	
Colby	100	28	67.1	1.60	
Columbus	92	41	71.8	2.53	
Cunningham	99	43	72.4	1.50	
Dresden	98	34	67.4	1.84	
Eldorado	98	42	72.1	3.19	
Ellinwood	98	42	70.6	4.64	
Ellsworth	103	37	72.4	5.03	
Emporia	97	41	70.6	2.35	
Englewood	101	43	74.8	5.39	
Enterprise	92	41	68.4	2.88	
Eureka	......	......	......	2.12	
Fall River	95	38	72.0	2.86	
Farnsworth	99	30	68.8	1.41	
Forsha	98[d]	49[d]	73.1[d]	2.35	
Fort Leavenworth	93	42	70.9	4.50	
Fort Scott	96	38	70.8	1.41	
Frankfort	101	34	68.4	2.09	
Fredonia	96	42	72.2	4.24	
Garden City	98	40	71.3	3.39	
Gove*[1]	103	41	68.3	1.26	
Grenola	94	36	70.6	2.26	
Hanover	99[d]	30[d]	66.0[d]	2.16	
Harrison	100	35	66.2	2.04	
Holton	96[e]	40	69.6[e]	4.48	
Horton	95	41	69.4	2.97	
Hoxie	99	31	68.1	1.74	
Hugoton	100	38	70.0	4.48	
Hutchinson	99	39	69.4	2.31	
Independence	98	43	73.3	3.87	
Jetmore	100[l]	39[l]	69.0[l]	1.54	
Lakin	95	36	67.6	2.53	
Larned	102	37	67.8	1.81	
Lebanon	98	37	67.4	2.40	
Lebo	95	43	71.2	3.29	
Macksville	98	40	69.4	2.57	
McPherson	102	40	71.0	5.14	
Madison	97	35	71.0	2.39	
Manhattan *b*	97	38	70.8	4.11	
Manhattan *c*	100	37	70.3	4.88	
Marion	93[c]	41[c]	71.1[c]	3.10	
Medicine Lodge	103	39	74.0	1.47	
Minneapolis	99	38	69.4	2.46	
Moran	94	43	72.6	1.27	
Mounthope	93	45	71.7	3.78	
Ness City	99	39	70.8	1.63	
Norton	98	35	67.0	1.45	
Norwich	98	43	73.3	2.06	
Oberlin	......	......	......	2.05	
Olathe	92	41	70.3	2.01	
Osage City	96	37	70.0	2.70	
Osborne	......	......	......	1.94	
Oswego	93	39	72.8	1.42	
Ottawa	95	34	70.4	3.98	
Phillipsburg	101	36	68.3	1.78	
Plainville	95	45	70.4	1.64	
Pleasanton	93	38	72.0	0.64	
Pratt	101	40	71.0	2.35	
Republic	102	36	67.8	2.35	
Rome	102	40	74.6	0.90	
Russell	101	40	69.1	0.76	
Salina	101	37	70.8	3.38	
Sedan	92	40	71.7	5.01	
Toronto	100	34	70.4	1.57	
Ulysses	94[h]	40[h]	68.6[e]	3.62	
Valley Falls	92	39	68.8	4.98	
Viroqua	95	36	69.2	4.55	
Wakeeney	97	34	69.2	1.31	
Wakeeney (near)	......	......	......	1.35	
Wallace	98	29	66.8	2.29	
Walnut	92	41[e]	71.5[c]	1.76	
Wamego*[1]	91	45	69.0	4.23	
Kansas—Cont'd.	°	°	°	*Ins.*	*Ins.*
Winfield	97	40	71.0	1.97	
Kentucky.					
Alpha	90	38	72.0	1.10	
Anchorage	95	40	70.8	2.43	
Bardstown	96	38	73.0	2.07	
Beattyville	94	39	71.2	0.30	
Beaver Dam	99	37	72.0	3.14	
Berea	90	34	67.8	0.90	
Blandville	91	44	70.9	3.04	
Bowling Green	98	38	72.7	2.24	
Burnside	98	41	72.0	1.90	
Cadiz	97	42	73.6	4.24	
Calhoun	96[e]	43[j]	72.7[f]	5.04	
Catlettsburg	95	42	70.9	1.24	
Earlington	94	41	70.8	5.80	
Edmonton	95	35	71.4	1.48	
Eubank	91	37	69.6	0.87	
Falmouth	......	......	......	1.69	
Fords Ferry	94	38	71.1	7.65	
Frankfort	89	42	69.8	1.67	
Greensburg	95	35	70.8	2.66	
Highbridge	97	40	72.6	1.55	
Hopkinsville	96	39	72.0	3.82	
Irvington	93	42	71.8	3.02	
Jackson	94	43	71.8	1.25	
Leitchfield	92	40	69.7	4.33	
Loretto	95	34	71.5	1.85	
Manchester	95	39	71.2	0.60	
Mayfield	90	43	71.4	2.89	
Maysville	95	40	70.0	2.72	
Mount Sterling	89	40	69.1	1.19	
Owensboro	92	44	71.1	4.05	
Owenton	80[d]	47[e]	71.0[e]	2.34	
Paducah *a*	......	......	......	3.41	
Paducah *b*	98	46	73.6	3.57	
Princeton	95	40	72.3	3.74	
Richmond	93	41	72.2	1.61	
St. John	91	38	69.6	2.49	
Scott	95	42	70.0	2.28	
Shelby City	93	38	70.6	2.09	
Shelbyville	96	38	71.0	1.87	
Taylorsville	92	36	69.8	2.17	
Williamsburg	94	40	71.0	2.33	
Williamstown	94	42	68.8	2.95	
Louisiana.					
Abbeville	94	65	79.8	6.71	
Alexandria	95	61	79.2	4.22	
Amite	96	64	79.6	4.76	
Baton Rouge	98	66	82.1	5.37	
Burnside	92	64	78.3	6.18	
Calhoun	99[f]	54[f]	77.3[f]	2.94	
Cameron	91	66	81.7	3.59	
Cheneyville	95	63	79.4	4.27	
Clinton	93	60	77.6	4.21	
Collinston	98	54	78.4	1.92	
Covington	99	63	80.8	4.31	
Donaldsonville	100	67	82.8	7.25	
Emilie	94	65	78.7	2.64	
Farmerville	97[b]	49[e]	79.1[d]	0.82	
Franklin	97	65	80.9	2.66	
Grand Coteau	95	63	79.4	4.15	
Hammond	94	64	78.5	3.57	
Houma	92	64	77.9	4.32	
Jennings	94	63	79.4	3.70	
Lafayette	94	64	79.5	4.77	
Lake Charles	97	65	79.2	6.81	
Lakeside	96	67	80.8	3.74	
Lawrence	99	69	81.6	4.32	
Leesville	95	59	77.6	3.13	
Libertyhill	99	58	79.2	1.80	
Logansport	......	......	......	2.34	
Mansfield	97[e]	54[d]	77.2[d]	......	
Melville	97	61	79.0	2.95	
Minden	99	51	77.0	0.15	
Monroe	103	59	79.4	1.84	
New Iberia	......	......	......	6.40	
Opelousas	96	62	79.4	3.22	
Oxford	98[e]	56[e]	80.6[e]	2.86	
Plain Dealing	99	52	78.8	3.11	
Port Eads	90	70	82.0	6.64	
Rayne	97	65	80.0	5.40	
Reserve	94	66	79.5	5.28	
Robeline	97	59	77.9	3.90	
Ruston	101	54	80.1	0.47	
St. Francisville	95	64	79.3	2.63	
Schriever	97	62	79.6	2.24	
Southern University	......	......	......	2.92	
Sugar Experiment Station	93	68	80.1	3.24	
Sugartown	93	63	78.9	2.41	
Venice	94	61	78.4	4.05	
Maine.					
Bar Harbor	78	27	55.2	9.81	
Belfast	82	26	56.4	6.30	
Cornish	82	26	56.8	5.10	
Fairfield	80	26	56.0	5.58	
Farmington	84	21	54.9	4.44	
Gardiner	82	28	57.2	5.09	
Houlton	75	24	51.0	6.70	
Maine—Cont'd.	°	°	°	*Ins.*	*Ins.*
Lewiston	87	28	58.2	3.82	
Madison	82	24	54.2	6.34	
Mayfield	76	25	52.5	5.73	
Millinocket	78	25	52.8	6.46	
North Bridgton	85	26	57.6	4.25	
Oquossoc	80	20	49.6	6.63	
Orono	80	26	55.6	6.47	
Patten	78	20	50.8	10.42	
Rumford Falls	82	22	55.2	4.75	
South Lagrange	80	22	54.4	5.93	T.
Vanburen	76	23	49.6	5.10	T.
Vanceboro	86	20	53.4	6.76	T.
Winslow	80	23	53.4	5.84	
Maryland.					
Annapolis	88	40	69.4	6.22	
Bachmans Valley	88	31	64.8	2.57	
Boettcherville	99	28	68.2	1.11	
Cambridge	98	37	71.4	5.10	
Chase	86	32	64.2	2.50	
Cheltenham	92	35	67.4	4.21	
Chestertown	87	37	66.3	3.57	
Chewsville	90	32	65.9	3.85	
Clearspring	89	34	65.2	3.13	
Coleman	94	37	68.6	6.14	
Collegepark	95[c]	30[c]	67.7[c]	......	
Colora	......	......	......	4.54	
Cumberland	......	......	......	0.60	
Darlington	85	35	64.2	3.94	
Deerpark	85[h]	28[h]	59.4[h]	1.50	
Denton	93	32	67.9	4.92	
Easton	91	35	67.4	4.91	
Fallston	87	33	65.7	4.64	
Frederick	94	31	68.0	2.28	
Grantsville	90	27	63.8	1.05	
Greatfalls	94	35	68.2	3.58	
Greenspring Furnace	90[h]	32[h]	66.3[h]	3.30	
Hancock	95	30	68.6	2.36	
Harney	......	......	......	2.32	
Jewell	90	38	68.6	5.44	
Johns Hopkins Hospital	88	40	68.6	......	
Laurel	95	35	68.2	4.75	
McDonogh	......	32	......	4.35	
Mount St. Marys College	83	36	65.8	2.50	
New Market	90	33	66.7	2.58	
Oakland	88	29	61.9	2.96	
Pocomoke City	91	39	69.8	1.63	
Princess Anne	90	34	67.8	2.88	
Solomons	89	43	71.4	2.47	
Sudlersville	93	34	69.4	4.47	
Takoma Park	93	34	66.4	5.23	
Van Bibber	85	36	65.0	4.77	
Westernport	91	32	65.7	2.61	
Woodstock	87	34	66.4	3.42	
Massachusetts.					
Amherst	84	26	60.3	5.45	
Bedford	80	31	59.9	4.97	
Bluehill (summit)	83	30	60.4	6.04	
Cambridge	86	30	62.0	5.84	
Chestnuthill	88	32	62.6	5.75	
East Templeton*[1]	80	31	57.5	4.16	
Fall River	79	33	61.5	2.14	
Fitchburg *a**[1]	81	32	58.9	4.02	
Fitchburg *b*	84	28	60.8	3.68	
Framingham	85	25	61.2	5.64	
Groton	82	25	58.4	4.26	
Hyannis	......	......	......	1.44	
Jefferson	......	......	......	5.72	
Lawrence	79	30	60.2	5.60	
Leominster	......	......	......	5.50	
Lowell *a*	83	29	62.4	5.51	
Lowell *b*	87	27	61.6	......	
Ludlow Center	79	22	65.4	6.29	
Middleboro	82	25	60.0	3.64	
Monson	81	26	60.0	6.80	
New Bedford	79	30	60.2	2.92	
Plymouth*[1]	79	36	60.7	3.18	
Princeton	......	......	......	5.68	
Provincetown	80	36	63.4	2.25	
Somerset	88	27	64.2	3.62	
Sterling	......	......	......	5.22	
Taunton	80	23	59.9	3.45	
Webster	......	......	......	5.13	
Westboro	84	25	62.1	5.21	
Weston	83	26	59.6	5.97	
Williamstown	80	29	57.3	5.39	
Winchendon	......	......	......	5.27	
Worcester	84	32	61.4	3.65	
Michigan.					
Adrian	90	30	63.4	3.25	
Agricultural College	84[i]	32[j]	62.0[k]	2.35	
Allegan	84[f]	30[f]	62.6[f]	2.44	
Alma	84	27	60.3	3.31	
Ann Arbor	87	31	62.2	3.91	
Arbela	85	30	62.2	4.25	
Baldwin	84	33	60.8	......	
Ball Mountain	85	38	60.5	2.55	
Baraga	......	......	......	2.57	
Battlecreek	84	32	61.7	3.96	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
Michigan—Cont'd.					
Bay City	85	30	60.4	2.25	
Benzonia	81	30	58.6	2.98	
Berlin	85	26	60.6	4.01	
Berrien Springs	88[e]	35[e]	63.2[e]	2.62	
Big Rapids	85	22	58.8	1.96	
Birmingham	86	37	62.6	2.76	
Bloomingdale	87	33	63.0	3.50	
Calumet	72	35	53.0	5.06	
Cassopolis	85	36	64.8	3.80	
Charlevoix	82	40	59.1	3.55	
Chatham	78	22	51.2	4.32	
Cheboygan	85	27	58.5	6.04	
Clinton	87	28	62.6	3.82	
Coldwater	85	33	64.0	5.44	
Deer Park	75	29	52.8	5.65	
Dundee	89	30	63.2	4.30	
Eagle Harbor	70	37	52.4	5.15	
East Tawas	81	30	59.4	1.93	
Eloise	87	30	62.8	3.83	
Ewen	83	23	52.6	…	
Fennville	82	33	61.6	2.14	
Fitchburg	86	22	60.6	2.64	
Flint	88	27	61.0	2.69	
Gaylord	80	29	57.4	…	
Gladwin	85	22	58.5	4.50	
Grand Haven	77	34	60.6	3.29	
Grape	87	30	62.2	4.67	
Grayling	85	24	57.1	3.95	
Hagar	90	32	63.4	5.55	
Harbor Beach	88	30	61.6	1.90	
Harrison	85[g]	29[g]	59.3[g]	1.82	
Harrisville	86	32	58.1	1.78	
Hastings	85	27	61.4	2.92	
Hayes	85[g]	28[g]	60.6[g]	1.34	
Highland	…	…	…	2.59	
Hillsdale	86	35	62.9	3.45	
Howell	86	29	60.6	2.39	
Humboldt	80	20	49.9	…	
Ionia	85[e]	33[j]	61.6[h]	…	
Iron Mountain	79	24	54.6	4.86	
Iron River	79	22	53.1	5.20	
Ironwood	76	25	54.6	3.46	
Ishpeming	74[d]	25	51.4	4.03	
Ivan	85	25	57.8	3.21	
Jackson	89	31	64.2	4.07	
Jeddo	86	31	61.0	4.17	
Kalamazoo	87	31	62.4	3.08	
Lake City	…	…	…	2.75	
Lansing	86	29	62.4	2.35	
Lapeer	90	30	62.4	2.74	
Ludington	82	31	60.7	1.16	
Mackinac Island	75	29	54.6	9.15	
Mackinaw City	80[e]	26	54.6[c]	6.10	
Mancelona	84	24[e]	57.3[e]	…	
Marine City	87	38[g]	61.6[d]	2.83	
Menominee	84	33	58.0	4.46	
Midland	78	30	57.9	…	
Montague[f]	86	39	64.1	3.15	
Mount Clemens	90	30	62.7	4.00	
Muskegon	84	33	62.4	4.11	
Newberry	76	34	54.8	…	
Old Mission	85	35	59.1	3.64	
Olivet	81	32	61.4	3.27	
Omer	84	…	…	2.89	
Onaway	85	27	58.2	…	
Ovid	83	31	61.6	5.37	
Owosso	…	…	…	1.25	
Petoskey	82	33	58.6	5.80	
Plymouth	91	24	60.5	…	
Powers	82	25	55.0	…	
Reed City	85	20	58.4	2.90	
Roscommon	80	18	56.2	1.90	
Saginaw (W. S.)	84	31	61.6	2.98	
St. Ignace	77	29	56.6	…	
St. Johns	89	29	63.4	4.28	
St. Joseph	…	…	…	3.90	
Slocum	79	30	58.9	4.57	
South Haven	79[c]	31	59.7[c]	2.79	
Stanton	84	26	59.0	4.60	
Thomaston	85	23	53.1	…	
Thornville	84	31	60.9	3.93	
Traverse City	82	31	60.0	4.10	
Vassar	85	…	…	2.60	
Wasepi	82	32	62.0	3.80	
Webberville	86	23	61.5	2.61	
West Branch	83[m]	25[m]	58.1[m]	…	
Wetmore	78	…	…	6.53	
Whitefish Point	70	32	52.6	5.28	T.
Ypsilanti	84	28	61.6	6.21	
Minnesota.					
Ada	88	25	55.6	…	
Albert Lea	86	34	60.8	1.76	
Alexandria	85	31	56.2	2.97	
Angus	84	23	53.5	1.56	
Beardsley	98	25	57.4	4.22	
Beaulieu	81[e]	27[e]	55.6[e]	3.95	
Bemidji	79	30	55.4	4.85	
Bird Island	83	32	58.8	2.85	
Minnesota—Cont'd.					
Blooming Prairie	87	32	59.6	2.25	
Caledonia	83	33	59.4	7.91	
Collegeville	80	32	56.7	3.79	
Crookston	81	26	53.4	2.12	
Currie	89	26	59.2	…	
Deephaven	…	…	…	4.15	
Detroit City	81	27	53.3	5.47	
Faribault	86	33	59.2	2.39	
Farmington	81	35	59.3	4.61	
Fergus Falls	83	33	56.0	3.53	
Glencoe	84	32	58.8	2.20	
Grand Meadow	87	34	59.7	3.05	
Hallock	81	22	52.0	1.66	
Lake Winnibigoshish	75	28	53.4	4.72	
Leech	78	25	52.4	4.90	
Long Prairie	81	24	56.2	2.48	
Luverne	90	29	59.4	0.49	
Lynd	88	27	59.6	2.70	
Mapleplain	84	32	58.9	3.13	
Milaca	82	23	55.8	4.05	
Milan	82	28	57.7	0.99	
Minneapolis[1]	85*	35	59.4	3.32	
Montevideo	90	34	59.8	1.27	
Mora	82	24	55.0	4.31	
Morris	85	30	56.4	2.35	
Mount Iron	75	21	52.0	3.91	
New London	86	32	57.8	0.60	
New Richland	86	34	61.5	4.03	
New Ulm	93	36	60.8	5.13	
Pine River	80	25	54.2	4.85	
Pleasant Mounds	84	34	60.8	1.58	
Pokegama Falls	79	15	50.0	4.49	
Redwing a	…	…	…	4.57	
Reeds	…	…	…	2.66	
Rolling Green	84	34	60.6	0.55	
St. Charles	84	37	60.0	4.45	
St. Peter	86	31	61.8	2.11	
Sandy Lake Dam	76	25	53.5	2.62	
Shakopee	82	33	59.2	2.46	
Wabasha	92	33	62.4	2.34	
Wadena	81	28	55.0	2.35	
Winnebago	89	33	61.4	1.68	
Winona	86	37	61.6	4.42	
Worthington	90	29	60.2	1.48	
Zumbrota	85	32	59.0	2.14	
Mississippi.					
Aberdeen	97	43	76.5	1.92	
Austin	97	41	75.2	0.71	
Batesville	95	42	75.5	0.46	
Bay St. Louis	96	64	80.1	2.71	
Biloxi	98	67	81.7	1.15	
Booneville	95	45	75.2	1.49	
Brookhaven	97	56	78.5	1.55	
Canton	98	50	78.9	3.06	
Columbia	97	58	79.2	0.64	
Columbus	98	45	78.2	2.33	
Corinth	91	42	73.6	1.26	
Crystal Springs	96	56	79.3	1.66	
Duck Hill	100	40	77.4	1.10	
Edwards	98	53	78.2	0.90	
Fayette	92	57[h]	76.1[f]	0.40	
Fayette (near)	…	…	…	0.66	
Greenville a	94	51	77.9	0.02	
Greenville b	96	53	78.4	0.04	
Greenwood	97	47	77.4	0.64	
Hazlehurst	99	60	79.2	1.15	
Hernando	101	49	78.0	2.13	
Holly Springs	93	49	76.0	1.76	
Indianola	96	…	…	0.00	
Jackson	95	54	78.4	1.19	
Kosciusko	101	50	79.0	0.70	
Lake	97	51	77.5	2.97	
Lake Como	101	51	79.2	1.90	
Laurel	99	59	80.2	1.39	
Leakesville	99	57	80.0	3.96	
Louisville	99	50	78.6	0.22	
Macon	98	41	76.2	1.20	
Magee	96[e]	55[e]	77.6[e]	1.32	
Magnolia	100	59	80.2	1.11	
Natchez	98	60	79.8	1.82	
Nitta Yuma	98	60	78.0	0.00	
Okolona	100	44	76.8	0.43	
Patmos	…	…	…	T.	
Pearlington	98	63	79.7	6.46	
Pecan	99	63	80.4	1.87	
Pittsboro	100	45	77.5	1.46	
Pontotoc	97	45	75.7	T.	
Poplarville	96	62[d]	78.2[b]	2.44	
Port Gibson	97	56	78.8	3.01	
Ripley	94	39	73.4	3.20	
Shelby	101	…	…	0.37	
Shoccoe	98	50	77.8	1.12	
Stonington	…	…	…	1.15	
Suffolk	99	56	78.9	1.10	
Tchula	97	…	77.8	0.01	
Tupelo	95	40	73.6	2.74	
University	98	49	77.2	0.85	
Utica	97	55	78.0	2.30	
Mississippi—Cont'd.					
Walnutgrove	95	52	77.4	0.61	
Watervalley	100	45	77.7	1.00	
Waynesboro	98	54	78.6	3.05	
Woodville	94	61	79.0	3.69	
Yazoo City	98	52	78.8	T.	
Missouri.					
Appleton City	95	39	70.8	1.74	
Arthur	93	38	70.6	1.47	
Avalon	91	38	68.0	6.69	
Bethany	86	34	65.6	3.20	
Birchtree	90[d]	42[d]	70.9[d]	2.63	
Blue Springs	89	38	69.0	1.54	
Boonville	…	…	…	9.72	
Brunswick	91	41	68.0	4.23	
Caruthersville	96[i]	49[i]	73.8[i]	3.72	
Conception	88	40	67.5	4.67	
Darksville	89	40	68.7	6.55	
Dean	92	39	72.7	1.94	
Desoto	90	43	70.4	5.83	
Doniphan	94	42	71.4	2.43	
Downing	…	…	…	7.19	
Fairport	…	…	…	4.04	
Fayette	90	35	67.4	4.64	
Fulton	92[c]	36[c]	70.2[c]	5.54	
Gallatin *[i]	92	44	70.1	4.43	
Gano	91	40	70.6	7.40	
Glasgow	92	41	69.6	5.37	
Gorin	…	…	…	6.92	
Grant City	90	37	67.6	3.17	
Halfway	91	38	71.1	2.32	
Harrisonville	95	38	70.4	2.40	
Hazlehurst	…	…	…	3.62	
Hermann	…	…	…	4.55	
Houston	92	36	69.5	2.10	
Huntsville	90	42	68.9	5.12	
Ironton	91	36	69.2	4.20	
Jackson	94	41	70.7	4.71	
Jefferson City	92	39	70.0	3.90	
Joplin	92	43	73.4	1.71	
Kidder	90	42	67.0	3.94	
Koshkonong	93	44	71.5	1.99	
Lamar	94	40	72.1	0.94	
Lamonte	…	…	…	3.98	
Lebanon	92	46	70.8	6.57	
Lexington	92	41	69.8	2.74	
Liberty	90	42	69.2	2.14	
Lockwood	92[i]	40[i]	72.0[i]	1.20	
Louisiana	92	36	68.2	5.37	
Macon	93	41	69.7	3.77	
Marblehill	93	42	71.2	5.79	
Marshall[f]	90	39	68.6	2.15	
Maryville	87	40	65.5	4.13	
Mexico	94	38	70.0	3.27	
Miami *[b]	91	44	69.5	5.31	
Monroe City	91	39	68.5	5.41	
Montreal	92	35	70.0	6.58	
Mountaingrove	89	39	69.8	1.71	
Mount Vernon[h]	94	35	72.2	0.61	
Neosho	92	37	72.1	0.94	
Nevada	…	…	…	1.01	
New Haven	92	42	70.6	2.85	
New Madrid	…	…	…	2.49	
New Palestine	92	42	71.2	4.10	
Oakfield	91	42	70.5	5.16	
Olden	93	41	70.8	3.48	
Oregon	91	40	68.1	3.58	
Palmyra *[b]	90	42	69.0	4.36	
Pine Hill	…	…	…	4.52	
Princeton	95	39	68.2	3.31	
Protem	95	40[e]	71.8[e]	4.65	
Rockport	…	…	…	3.07	
Rolla	…	…	…	4.21	
St. Charles	90	44	70.8	3.03	
St. Joseph	…	…	…	2.39	
Sarcoxie	…	…	…	0.53	
Sedalia	91	41	70.6	2.60	
Seymour	90	34	68.2	1.88	
Sikeston	93	43	71.6	2.68	
Steffenville	88	41	67.8	5.78	
Sublett	87	35	67.6	7.85	
Trenton	88	42	66.7	3.56	
Unionville	92	40	67.1	6.05	
Versailles	91	41	70.0	3.23	
Warrensburg	94	44	72.0	2.95	
Warrenton	90	44	69.4	3.29	
Warsaw	94	36	69.0	2.23	
Wheatland	…	…	…	2.24	
Willowsprings	92	37	68.9	2.15	
Windsor	93	43	69.8	1.68	
Zeitonia	93	44	70.8	3.15	
Montana.					
Adel	88	18	51.8	0.12	
Anaconda	90	28	56.0	T.	
Augusta	88	19	55.6	0.16	
Boulder	89	27	54.1	0.00	
Bozeman	88	27	54.7	0.06	
Butte	87	33	56.8	0.00	
Canyon Ferry	95	31	52.3	T.	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Montana—Cont'd.	°	°	°	*Ins.*	*Ins.*
Cascade	95	26	60.4	0.13	
Chester	88	15	52.7	0.00	
Chinook	92[e]	28[e]	56.6[e]	0.25	
Columbia Falls	86	21	55.3		
Crow Agency	95	28	59.8	1.00	
Culbertson	93	25	55.4	0.08	
Dayton	86	31	58.3	*0.58	
Decker	102	20	59.9	0.50	
Deerlodge	85	25	52.6	......	
Dillon	86	26	53.6	0.07	
Forsyth	95	26	59.2	0.74	
Fort Benton				1.15	
Fort Harrison	93	30	57.9		
Glasgow	87	26	54.5	0.21	
Glendive	95	24	55.6	0.15	
Grayling	81	16	46.0	0.59	
Greatfalls	90	30	57.8	0.14	
Hamilton	84	33	59.0	0.26	
Lame Deer	96	29	61.5	1.42	
Lewistown	90	27	54.8	0.20	
Lodge Grass	95	28	59.2	0.38	
Marysville	86[e]	28[e]	54.7[e]	0.12	
Missoula	93	34	59.6	0.03	
Ovando	90	21	53.4	0.17	
Parrot	93	31	58.4	0.00	
Philipsburg	93	25	56.4	T.	
Plains	89	34	58.0	T.	
Poplar	93	24	56.6	0.00	
Redlodge	86	24	53.0	0.87	
Ridgelawn	94	20	56.0	1.01	
St. Pauls	87	30	57.8	1.18	T.
St. Peter	88	27	57.0	0.21	T.
Springbrook	95	28	57.3	0.15	T.
Toston	90	26	55.7	T.	
Townsend				0.18	
Troy	91	26	55.9	0.29	
Twin Bridges	94	26	58.0	0.10	
Utica	92	26	57.0	0.12	
Wolf Creek	92	24	57.6	0.04	
Yale	90	24	58.4	0.31	
Nebraska.					
Agate	93	15	58.2	1.72	
Agee *[1]	100	35	61.0	1.26	
Albion	93	33	61.2	1.93	
Alliance	97			1.37	
Alma	98	31	66.4	1.90	
Ansley	95	28	61.7	2.40	
Arapahoe				1.90	
Arcadia				4.08	
Ashland *a*	95	40	66.9	2.36	
Ashland *b*				2.74	
Ashton				2.01	
Auburn	92	36	66.2	2.33	
Aurora	98	37	65.7	3.00	
Bartley	102	31	66.3	1.93	
Beatrice	96	37	68.2	1.16	
Beaver	100	42	67.6	2.06	
Bellevue				4.40	
Benkleman				2.45	
Bethany				2.81	
Blair	91	39	64.6	1.44	
Bluehill				4.08	
Bradshaw				4.23	
Bridgeport	98	24	61.1	1.00	
Broken Bow	97	33	63.0	3.66	
Burchard				1.17	
Burge				1.15	
Burwell				2.87	
Callaway	94	29	63.2	1.83	
Central City				0.35	
Chester				2.26	
Columbus	101	35	64.2	1.10	
Crawford				1.60	
Crete	99	27	63.7	2.58	
Culbertson	98	37	67.4	1.98	
Curtis	93	30	63.4	1.69	
David City	95	37	64.4	1.81	
Dawson	95	41	69.1	2.02	
Duff				1.85	
Edgar				3.51	
Ericson				1.10	
Ewing				2.22	
Fairbury	103	35	67.4	3.93	
Fairmont	100	34	64.4	2.28	
Fort Robinson	96	19	59.8	1.50	
Fremont	95	38	65.2	1.58	
Fullerton				2.13	
Geneva	103	34	67.0	2.65	
Genoa (near)	96	35	63.6	1.88	
Gering	98	26	63.8	0.90	
Gordon				0.82	
Gothenburg	97	30	64.0	3.44	
Grand Island *a*	98	40	65.7	1.66	
Grant				2.31	
Greeley				0.71	
Guide Rock				2.20	
Haigler				3.13	
Halsey	93	28	62.4	2.13	
Nebraska—Cont'd.	°	°	°	*Ins.*	*Ins.*
Hartington				2.35	
Harvard	97	33	63.7	4.13	
Hastings *[1]	98	37	63.5	1.87	
Hayes Center				1.57	
Hay Spring	90[g]	20[g]	59.6[g]	3.14[g]	
Hebron	99	37	66.9	3.04	
Hickman				1.50	
Holbrook				2.78	
Holdrege	98	32	65.8	1.63	
Hooper *[1]	90	40	63.3	2.35	
Imperial	87	30	59.8	1.57	
Johnstown				1.10	
Kearney	98	34	65.9	2.01	
Kennedy	97	26	61.5	1.92	
Kimball	93	28	60.6	1.08	
Kirkwood	100	32	63.0	1.42	
Leavitt	96	34	64.6	1.80	
Lexington	96	30	62.6	3.05	
Lockridge	101	37	64.4	4.62	
Lodgepole	92	26	61.1[f]	2.50	
Loup	95	28	62.5	3.89	
Lynch	105	31	64.3	1.36	
McCool Junction				3.79	
Madison	95	37	63.3	1.60	
Marquette				1.90	
Mason				2.82	
Merriman				0.50	
Minden	98	30	64.4	1.48	
Monroe				1.71	
Nebraska City	90	39	67.6	1.53	
Nemaha				4.00	
Norfolk	99	36	63.8	1.92	
North Loup	98	30	63.8	2.85	
Oakdale	97	35	61.6	1.98	
Odell				1.84	
O'Neill	99	32	62.6	1.66	
Ord				1.80	
Osceola				2.85	
Palmer				1.85	
Palmyra *[1]	92	42	66.2	3.05	
Pawlet				1.38	
Pawnee City	93	36	67.8	4.38	
Plattsmouth *b*				2.68	
Purdum	99	29	62.3	2.96	
Ravenna *a*	97	32	63.6	2.34	
Redcloud	99	36	66.1	2.30	
Republican				1.62	
Rulo				1.62	
St. Libory				2.12	
St. Paul	100	34	65.2	2.60	
Santee	102	34	64.8	0.76	
Schuyler				1.89	
Seneca				1.25	
Seward	100	35	64.6	4.45	
Smithfield				1.79	
Springview	100	31	63.0	1.10	
Stanton	95	36	61.7	2.27	
Strang				3.76	
Stratton				1.89	
Stromsburg				3.56	
Superior	98	37	65.8	1.75	
Syracuse				1.35	
Tablerock				1.61	
Tecumseh *b*				2.67	
Tekamah	93	40	66.0	1.41	
Turlington	96	38	66.6	2.67	
University Farm	95	38	67.0	2.97	
Wahoo				1.11	
Wallace				1.60	
Wauneta				1.38	
Weeping Water				1.91	
Westpoint	97	36	64.4	1.88	
Whitman				2.00	
Wilber				1.70	
Wilsonville				1.05	
Winnebago	92	34	62.1	2.00	
Wisner				1.48	
Wymore				0.80	
York	101	41	66.8	5.72	
Nevada.					
Austin	83[e]	33[e]	61.6[e]	3.03	
Battle Mountain	103	36	65.2	1.17	
Belmont	82	31	56.2	1.98	T.
Caliente	102	35	67.2	0.30	
Candelaria	88	37	63.6	1.27	T.
Carlin *[1]	92	40	57.7	......	
Carson City	90	30	59.8	0.21	
Cranes Ranch				1.50	
Dyer	92	33	60.8	1.03	
Elko	89	31	59.3	1.79	
Ely	88	32	58.2	0.02	
Eureka	90	30	59.6	0.11	
Geyser	91	27	57.8	0.34	
Golconda				1.00	
Halleck [1]*	78	32	54.3	1.75	
Hawthorne	92	41	66.2	0.60	
Hamilton	82	25	54.9	0.22	
Humboldt	94	39	64.9	0.55	
Nevada—Cont'd.	°	°	°	*Ins.*	*Ins.*
Lewers Ranch	91	34	61.8	1.74	
Lovelocks *[1]	97	38	65.1	1.22	
Martins	100	32	63.6	0.24	
Mill City				0.40	
Morey [f]	93	30	61.0	0.60	
Palisade	96	30	59.8	1.28	
Palmetto	87	28	57.1	2.76	
Pioche	99	27	60.5	0.59	
Potts	86	31	55.2	1.28	
Reno State University	90	36	61.8	0.71	
San Jacinto	95	24	57.8	0.24	
Sodaville	101	37	67.6	1.45	
Tecoma	93	25	56.6	0.63	
Toano				0.25	
Wabuska	92	19	55.6	0.55	
Wadsworth	99	38	68.3	......	
Wells *[1]	84	34	55.8	......	
Wood	90	32	59.0	0.81	
New Hampshire.					
Alstead	80	24	56.7	6.24	
Berlin Mills	81[e]	20[e]	52.2[e]	4.12[e]	
Bethlehem	78	25	54.8	7.30	
Brookline *[1]	86	24	60.2	4.60	
Chatham	82	21	53.4	6.35	
Durham	87	21	57.8	2.94	
Franklin Falls	85	23	57.4	4.41	
Grafton	82	18	54.5	5.13	T.
Hanover	84	24	56.4	6.03	
Keene	83	21	58.1	4.91	
Littleton	78	25	52.0	6.60	T.
Nashua	86	26	61.1	4.18	
Newton	84	23	58.2	5.62	
Plymouth	82	21	55.8	6.40	
Stratford	78	20	52.9	6.40	
New Jersey.					
Asbury Park	84	41	66.0	3.30	
Bayonne	86	37	65.6	4.81	
Belvidere	83[f]	31[f]	62.7[f]	6.00[f]	
Bergen Point	85	36	64.9	4.81	
Beverly	89	34	66.8	5.64	
Blairstown	86	29	62.7	5.84	
Bridgeton	90	35	68.0	3.95	
Canton				2.94	
Cape May C. H	87	35	67.7	0.98	
Charlotteburg	84	23	60.6	6.88	
Chester	83	29	62.4	5.30	
Clayton	91	32	66.3	6.98	
College Farm	87	31	64.8	5.09	
Dover	48	28	60.6	6.30	
Elizabeth	86	32	63.8	4.36	
Englewood	83	32	63.4	4.41	
Flemington	87	31	64.4	3.71	
Friesburg	89	33	66.2	10.08	
Hightstown	85	33	64.6	2.65	
Imlaystown	87	33	66.3	8.48	
Indian Mills	93	32	66.7	6.03	
Lakewood	88	34	65.2	2.48	
Lambertville	87	32	65.0	5.24	
Layton	87	24	60.6	4.16	
Moorestown	88	32	65.8	5.84	
Newark	86	34	64.8	4.19	
New Brunswick	87	34	66.4	5.35	
Oceanic	86	40	65.6	3.94	
Paterson	87	34	65.4	3.50	
Phillipsburg	87	32	64.4	5.20	
Plainfield	86	31	64.1	7.02	
Pleasantville				0.98	
Rancocas				6.40	
Rivervale	83	27	61.4	6.35	
Sandy Hook	88	41	66.5	4.90	
Somerville	88	29	64.2	5.37	
South Orange	82	33	62.6	5.14	
Sussex	85	29	62.0	5.36	
Trenton	86	35	66.3	5.10	
Tuckerton	86	32	65.6	0.89	
Vineland	92	32	66.4	2.87	
Woodstown				7.89	
New Mexico.					
Alamagordo	98	49	72.4	2.10	
Albert	95	45	69.6	6.00	
Albuquerque	91	45	69.1	1.42	
Alma	91[e]	27[e]	66.0[e]	0.75	
Arabela	90	44	65.0	9.95	
Bellranch				4.04	
Bloomfield	90	30	66.8	0.68	
Cambray				5.23	
Carlsbad	98[f]	51[f]	74.0[f]	4.55	
Cloudcroft	72	36	51.2	6.16	
Deming	92	45	70.2	4.16	
Dorsey	89	40	63.0	7.11	
Eagle Rock Ranch	82	38	60.1	7.47	
Elk	90	45	63.9	7.04	
Engle	90	46	68.2	5.60	
Fort Stanton	87	39	61.8	6.06	
Fort Union	89	36	61.2	6.84	
Fruitland	87	28	63.0	0.53	
Gage				0.65	
Hillsboro				4.57	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	Ins.	Ins.
New Mexico—Cont'd.					
Las Vegas	88	37	62.0	6.07	
Los Lunas	89	46	67.2	2.45	
Luna	86	22	59.0	1.00	
Maxwell (near)	84	37	61.2	7.65	
Mesilla Park	97	52	70.6	4.02	
Mountainair	86	32	61.2	2.66	
Raton	85[j]	41[j]	61.8[j]	7.38	
Rociada	81	34	57.8	8.81	
Roswell	97	47	69.4	5.10	
San Marcial	97	44	71.4	2.00	
San Rafael	84	35	61.4	1.21	
Socorro	89	45	69.0	4.20	
Springer	89	38	63.9	......	
Strauss	......	......	......	2.68	
Taos	91	40	63.3	3.06	
Vermejo	78	32	55.8	5.30	
New York.					
Adams	......	......	......	8.24	T.
Addison	90	24	61.4	2.63	
Akron	......	......	......	3.41	
Alden	87	32	60.3	2.60	
Amsterdam	85	27	58.8	4.49	
Appleton	91	35	60.6	2.09	
Arcade	86	25	59.6	3.25	
Athens	84	31	61.2	6.53	
Atlanta	87	29	60.0	3.69	
Atwater	......	......	......	3.47	
Auburn	90	31	61.2	4.41	
Avon	86	28	59.3	5.42	
Baldwinsville	85	31	59.0	3.80	
Ballston Lake	82	26	58.2	4.11	
Bedford	84	30	61.8	2.40	
Berlin	85[d]	24	59.5	6.90	
Blue Mountain Lake	......	......	......	8.21	T.
Bolivar	86	20	58.8	4.43	
Bouckville	83	29	58.2	3.28	
Boyds Corners	......	......	......	7.21	
Brockport	89	34	61.8	2.77	
Caldwell	84	28	58.6	4.34	
Cape Vincent	76	37	58.2	4.90	
Carmel	76	29	60.2	7.73	
Carvers Falls	84	27	57.6	5.38	
Chatham	86	28	60.4	5.32	
Chazy	75	31	55.4	5.64	
Cooperstown	82	27	57.2	4.08	
Cortland	84	30	60.1	5.02	
Cutchogue	85	37	64.8	3.11	
Deansboro	......	......	......	2.90	
Dekalb Junction	80	27	56.8	5.21	
De Ruyter	83	26	57.6	3.72	T.
Easton	......	......	......	5.34	
Elba	88	35	60.4	3.25	
Elmira	94	28	62.8	3.52	
Faust	80	21	53.6	7.74	T.
Fayetteville	88	31	61.3	3.15	T.
Fort Plain	88	30	60.9	3.12	
Franklinville	85	21	58.3	5.26	
Gabriels	80	18	51.9	6.08	T.
Gansevoort	......	......	......	5.53	
Glens Falls	84	24	57.7	4.96	
Gloversville	83	25	57.3	4.51	
Greenwich	83	28	58.3	4.90	
Griffin Corners	84	20	56.4	3.52	
Harkness	83	29	55.1	4.01	T.
Haskinville	......	......	......	3.19	
Hemlock	83	34	60.8	2.45	T.
Homer	85	27	58.1	4.85	T.
Hunt[c]	82	27	58.8	2.33	
Indian Lake	79	19	53.5	5.10	T.
Ithaca	88	32	59.6	1.93	
Jamestown	85	24	60.9	5.59	
Jeffersonville	84	23	58.8	3.09	
Keene Valley	83	22	54.1	4.61	
Lake George	81	30	58.0	4.25	
Lenox	......	......	......	3.47	
Le Roy	86	34	60.2	5.06	
Liberty	79	23	57.9	3.41	
Littlefalls, City Res.	84	28	58.4	3.75	
Lockport	86	36	60.6	2.06	
Lowville	83	24	55.7	4.66	T.
Lyndonville	......	......	......	1.80	
Lyons	89[f]	39[f]	63.8[f]	3.50	
Middletown	83	32	61.0	6.76	
Mohonk Lake	78	31	59.0	7.37	
Moira	83	28	57.4	5.17	T.
Newark Valley	......	......	......	4.50	
New Lisbon	83	22	56.0	4.51	
Number Four	77	26	54.4	7.40	
Ogdensburg	......	......	......	5.26	
Old Chatham	......	......	......	4.82	
Oneonta	87	28	60.9	4.66	T.
Oswegatchie	80	25	53.8	8.14	T.
Otto	......	......	......	3.26	
Oxford	82	29	58.9	5.25	
Oyster Bay	80	33	63.0	6.72	
Palermo	......	......	......	7.64	
Perry City	88	26	58.5	2.80	
Port Jervis	87	29	62.1	6.80	
New York—Cont'd.					
Potsdam	80	27	56.8	5.21	
Primrose	85	29	63.4	2.69	
Redhook	......	......	......	5.86	
Richmondville	84	27	59.6	3.86	
Ridgeway	86	38	60.4	2.04	
Ripley	88	33	62.3	2.25	
Rome	88	31	60.8	4.42	
Romulus	86	32	60.4	3.94	
Salisbury Mills	......	......	......	5.43	
Saranac Lake	79	23	52.2	4.15	T.
Saratoga Springs	81	26	58.4	5.20	
Scarsdale	84	29	61.6	3.09	
Scottsville	......	......	......	3.44	
Setauket	81	37	63.5	3.78	
Shortsville	86	36	60.1	4.09	
Skaneateles	......	......	......	4.82	
Southampton	80	35	63.5	1.75	
South Butler	......	30	59.4[d]	3.13	
South Canisteo	86	25	59.5	3.01	
Southeast Reservoir	......	......	......	4.64	
South Kortright	84	21	58.2	4.34	
South Schroon	80	22	53.9	5.08	T.
Spier Falls	83	28	58.0	4.73	
Straits Corners	85	22	58.9	3.64	
Ticonderoga	88	33	58.7	4.52	
Volusia	85	30	59.6	1.92	
Wappinger Falls	83	31	61.5	6.51	
Warwick	......	......	......	6.01	
Watertown	82	27	58.4	6.48	T.
Waverly	90	23	60.4	3.38	
Wedgwood	85	31	58.6	2.13	
Wells	83	20	55.2	4.74	
West Berne	86	24	59.3	3.57	
Westfield	87	33	62.0	1.99	
Windham	86	23	58.4	3.31	
Youngstown	......	......	......	1.80	
North Carolina.					
Brevard	89	40	67.8	1.38	
Bryson City	......	......	......	0.64	
Currituck	......	......	......	1.54	
Eagletown	89	41	69.9	2.37	
Edenton	88	43	69.6	2.88	
Fayetteville	......	......	......	3.89	
Flatrock	90	36	67.4	1.51	
Goldsboro	90	44	71.3	4.59	
Graham	......	......	......	6.71	
Greensboro	91	40	69.9	2.08	
Henderson	88	40	69.4	3.73	
Hendersonville	88	38	66.3	1.44	
Henrietta	94	44	72.8	0.82	
Highlands	81	33	59.8	2.81	
Horse Cove	85	45	66.4	2.40	
Hot Springs	89	48	70.0	......	
Jefferson	84	35	63.6	2.65	
Kinston	90	44	71.6	4.75	
Kittyhawk	89	56	73.8	2.54	
Lenoir[b]	93	41	68.4	......	
Lexington	99	42	70.3	3.35	
Lincolnton	93	36	65.3	......	
Linville	76	31	59.2	2.23	
Littleton	90	37	67.9	6.54	
Louisburg	88	42	69.9	3.08	
Lumberton	93	45	72.4	7.28	
Moncure	93	43	71.4	5.39	
Monroe	93	40	69.8	1.31	
Morganton	91	41	69.5	3.91	
Mountairy	93	39	68.7	0.73	
Mount Holly	......	......	......	2.31	
Murphy	......	......	......	1.93	
Nashville	93	40	71.4	3.98	
Newbern	91	47	73.6	2.04	
Patterson	......	......	......	0.91	
Pinehurst	92	42	72.4	5.35	
Pittsboro	92[e]	42[e]	70.6[e]	7.81	
Reidsville	90	39	70.8	4.68	
Salem	89	40	69.2	2.15	
Salisbury	93	41	70.7	1.76	
Saxon	90	38	67.6	1.57	
Scotland Neck	90	42	71.1	5.21	
Selma	91	43	70.8	4.40	
Settle	97	43	70.2	1.09	
Sloan	92[e]	51[e]	73.4[e]	5.13	
Soapstone Mount	89	44	68.8	4.42	
Southern Pines *a*	96	40	74.2	5.73	
Southern Pines *b*	95	40	73.9	6.83	
Statesville	94[d]	41[d]	69.4[d]	1.31	
Tarboro	93	41	72.6	2.70	
Washington	93	43	72.6	2.89	
Waynesville	87	41	67.4	0.39	
Weldon *a*	93	39	71.6	4.35	
Weldon *b*	......	......	......	4.14	
North Dakota.					
Amenia	87	24	55.8	2.51	
Ashley	91	21	53.6	2.07	
Berlin	94	19	55.0	1.48	
Buxton	82	26	54.0	2.11	
Cando	80	29	53.1	0.91	
Churchs Ferry	84	22	54.0	1.84	
North Dakota—Cont'd.					
Coalharbor	84	26	58.1	0.80	
Cooperstown	85	23	53.0	1.29	
Devils Lake	83	25	53.6	1.09	
Dickinson	96	18	57.5	0.26	
Donnybrook	84	22	54.9	1.00	
Dunseith	80	24	52.3	1.06	
Edgeley	94	23	57.0	0.78	
Ellendale	91	26	60.8	1.41	
Fargo	87	28	54.6	3.49	
Forman	92	26	56.7	4.56	
Fort Berthold	94	21	57.7	1.50	
Fort Yates	92	29	59.5	1.11	
Fullerton	91	25	55.8	2.17	
Glenullin	88[f]	27[f]	54.4[f]	T.	
Grafton	80	25	52.8	1.13	
Hamilton	81	25	51.9	2.30	
Jamestown	96	23	55.0	0.90	
Kulm	94	25	56.8	1.47	T.
Lamoure	......	......	......	1.73	
Langdon	76	23	49.7	2.32	
Larimore	85	24	53.0	1.31	
Lisbon	90	26	54.9	2.66	
McKinney	85	20	51.6	2.85	
Manfred	84	19	54.2	0.40	
Mayville	92	24	58.4	2.14	
Medora	94	19	55.6	0.67	
Melville	92[h]	20[h]	54.9[h]	1.04	
Milton	81	25	53.0	1.76	
Minnewaukon	83	24	54.2	1.39	
Minot	90	25	57.6	1.20	
Minto	84	21	52.0	1.13	
Napoleon	90	20	56.2	1.51	
New England	88	19	54.5	0.60	
Oakdale	86[d]	27[d]	56.8[d]	0.40	
Park River	85	26	54.0	1.35	
Pembina	78	25	51.0	1.59	
Power	88	28	55.8	3.21	
Rolla	83	26	52.0	1.15	
Rugby	79	25	52.7	1.00	
Sentinel Butte	96	21	58.0	0.59	
Steele	88	23	55.2	0.82	
University	83	25	54.4	1.91	
Wahpeton	86	34	57.5	6.44	
Walhalla	82	27	52.5	1.86	
Willow City	83	23	52.2	0.95	
Wishek	89	22	54.0	1.70	
Ohio.					
Amesville	92	34	68.0	0.95	
Atwater	......	......	......	1.21	
Bangorville	87	34	64.6	3.16	
Bellefontaine	90	36	64.0	1.93	
Benton Ridge	92	37	66.2	1.79	
Bowling Green	91	34	64.4	3.08	
Bucyrus	88	35	64.0	2.31	
Cadiz	88	33	65.4	1.70	
Cambridge	93	34	66.2	1.41	
Camp Dennison	97	36	68.9	1.19	
Canal Dover	87	32	63.5	2.65	
Canton	87	32	63.6	1.08	
Cardington	89	33	64.6	2.92	
Chillicothe	92	41	68.6	0.95	
Circleville	92	40	67.3	1.10	
Clarington	92	37	68.5	1.84	
Clarksville	92	42	69.0	0.83	
Cleveland *a*	87	37	63.6	3.77	
Cleveland *b*	87	35	62.6	2.84	
Clifton	91	40	67.1	1.83	
Coalton	94	35	67.6	1.55	
Dayton *a*	......	......	......	1.72	
Dayton *b*	91	39	66.6	2.00	
Defiance	91	33	64.6	3.12	
Delaware	89	33	65.0	3.26	
Demos	89	32	66.6	1.94	
Elyria	90	32	63.4	1.73	
Findlay	93	35	65.7	2.71	
Frankfort	90	40	67.6	1.44	
Fremont	92	37	66.3	2.13	
Garrettsville	87	25	61.5	2.01	
Granville	90	37	65.8	0.91	
Gratiot	87	36	65.4	1.65	
Green	90	40	67.8	1.53	
Greenfield	88	45	67.3	1.05	
Greenhill	87	30	62.0	0.97	
Greenville	91	39	65.4	2.18	
Hanging Rock	95	38	70.1	0.76	
Hedges	91	35	64.6	2.52	
Hillhouse	88	26	62.0	3.64	
Hiram	86	30	62.4	1.56	
Hudson	89	26	62.8	1.94	
Jacksonburg	94	42	68.6	2.72	
Killbuck	88	33	64.2	0.94	
Lancaster	89	38	66.2	1.53	
Lima	85	38	64.0	2.25	
McConnelsville	92	38	66.4	1.60	
Manara	90	38	66.6	1.67	
Mansfield	......	......	......	1.53	
Marietta	89	40	68.0	1.40	
Marion	92	32	66.0	2.76	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
	°	°	°	*Ins.*	*Ins.*
Ohio—Cont'd.					
Medina	89	29	64.4	2.93	
Milfordton	89	33	65.0	1.44	
Milligan	92	34	65.6	1.72	
Millport	89	29	62.1	1.26	
Montpelier	86	35	63.2	4.47	
Napoleon	87	36	64.9	2.94	
Nellie	86	31	66.1	0.84	
New Alexandria	91	35	65.9	1.06	
New Berlin	87	29	63.8	1.14	
New Richmond	93	43	70.2	1.48	
New Waterford	88	25	62.2	0.72	
North Lewisburg	89	36	65.5	2.00	
North Royalton	87	31	63.5	2.09	
Norwalk	90	35	64.1	3.03	
Oberlin	88	32	63.4	2.18	
Ohio State University	89	35	65.4	0.61	
Orangeville	87	23	61.6	1.95	
Ottawa	92	35	66.0	2.08	
Pataskala	89	37	65.5	2.23	
Philo	90	36	67.7	2.13	
Plattsburg	85	39	65.7	2.30	
Pomeroy	93	38	67.3	0.26	
Portsmouth *a*	.....	.....	.....	1.10	
Portsmouth *b*	92	43	68.9	0.34	
Pulse	90	39	67.5	0.84	
Rittman	89	30	64.4	2.48	
Rockyridge	92	38	65.6	2.83	
Shenandoah	86	32	62.9	2.64	
Sidney	93	39	66.8	1.75	
Somerset	89	37	67.0	2.35	
Springfield	.....	.....	.....	2.56	
South Lorain	91	31	64.0	2.62	
Thurman	99	38	71.0	0.13	
Tiffin	88	37	64.9	2.29	
Upper Sandusky	92	34	65.9	1.60	
Urbana	91	40	65.4	1.94	
Vickery	91	35	64.3	2.62	
Warren	89	26	63.4	1.78	
Wauseon	90	34	63.4	3.86	
Waverly	94	40	68.8	1.80	
Waynesville	90	41	66.8	1.07	
Wellington	90	31	65.2	1.92	
Willoughby	.....	.....	.....	2.94	
Wooster	89	31	64.2	2.27	
Zanesville	.....	.....	.....	1.36	
Oklahoma.					
Alva	104	47	77.0	2.12	
Arapaho	101	46	75.5	0.75	
Beaver	99	42	73.2	1.11	
Binger	100[d]	42[d]	73.6[d]	1.79	
Busch	100	42	75.5	0.47	
Chandler	100	43	75.0	4.08	
Cloud Chief	101	45	74.2	1.20	
Eldorado	97	45	74.9	1.30	
Enid	99	42	75.3	0.58	
Erick	100	44	74.7	0.63	
Fort Reno	100	44	74.8	4.75	
Fort Sill	99	47	72.2	5.77	
Frederick	102	50	76.2	3.70	
Gage	97	46	73.6	0.97	
Grand	100	49	75.6	0.24	
Guthrie	95	49	73.8	1.72	
Harrington	97	45	72.4	0.64	
Hennessey	102	45	75.8	1.80	
Hobart	101	45	75.8	1.02	
Jefferson	99	43	75.0	0.40	
Jenkins	98	43	74.2	0.64	
Kenton	95	41	68.4	5.22	
Kingfisher	101	43	76.6	1.15	
McComb	95	45	73.6	4.78	
Mangum	100	50	77.3	0.20	
Meeker	100	41	74.0	4.39	
Newkirk	99	43	75.8	2.94	
Norman	100	45	75.5	3.50	
Pawhuska	99	42	73.5	3.40	
Perry	99	44	75.3	1.25	
Shawnee	98	46	74.7	4.09	
Stillwater	97	43	73.4	1.66	
Taloga	102	40	77.4	0.85	
Temple	102	48	75.4	6.44	
Waukomis	106	44	77.5	0.95	
Weatherford	99	44	73.0	3.13	
Whiteagle	99	45	74.5	1.83	
Woodward	98	42	75.5	1.62	
Oregon.					
Albany	.....	.....	.....	1.43	
Alpha	92	34	61.4	0.78	
Arlington	93	40	66.4	0.20	
Ashland	92	41	62.8	0.55	
Astoria	76	41	60.0	0.92	
Aurora (near)	89	35	60.8	0.47	
Bay City	73	35	54.2	2.71	
Bend	92	28	57.4	0.28	
Beulah	95	32	60.8	0.30	
Blackbutte	85	38	58.5	0.95	
Blalock	99	45[f]	70.6[f]	T.	
Bullrun	.....	.....	.....	0.68	
Burns	93	36	60.9	1.67	
Oregon—Cont'd.					
Butter Creek	.....	.....	.....	0.30	
Cascade Locks	91	45	64.6	0.09	
Condon	94	36	60.6	0.50	
Coquille	.....	.....	.....	0.96	
Corvallis	91	31	61.6	0.59	
Dayville	93	33	60.0	2.03	
Doraville	87	41	60.8	0.45	
Drain	94	31	60.6	1.01	
Ella	.....	.....	.....	0.27	
Fairview	89	38	60.4	0.64	
Falls City	89	34	59.6	1.51	
Forestgrove	94	30	61.7	0.50	
Gardiner	78	43	57.6	0.52	
Glendale	97	32	63.8	0.60	
Glenora	93	30	59.8	0.70	
Gold Beach	79	41	55.2	1.10	
Government Camp	83[d]	33[d]	55.7[d]	1.25	
Grants Pass	99[c]	38[c]	64.2[c]	0.40	
Grass Valley	98	28	58.0	0.25	
Heppner	90	37	60.6	0.86	
Hood River	92	40	63.7	0.32	
Huntington	95	40	67.4	0.56	
Jacksonville	92	42	65.1	0.45	
Joseph	88	34	58.2	0.31	
Kerby	97	39	62.4	1.50	
Lagrande	94	31	60.8	1.01	
Lakeview	90	30	60.2	1.10	
Lonerock	94	34	59.8	0.46	
McKenzie Bridge	100	32	60.2	0.53	
McMinnville	93	31	60.5	0.69	
Meacham	.....	.....	.....	1.95	
Monroe	88	40	62.4	1.05	
Mount Angel	92	45	64.9	0.57	
Nehalem	.....	.....	.....	1.73	
Newport	70	39	53.2	1.54	
Ontario	.....	.....	.....	0.20	
Pendleton	96	32	61.5	0.38	
Pine	94	28	57.9	0.25	
Prineville	91	29	57.7	0.43	
Riverside	99	28	60.4	0.65	
Salem	90	40	62.4	0.42	
Silverlake	92	22	54.4	.....	
Sparta	95	38	62.7	0.80	
Stafford	93[d]	39[d]	64.2[d]	0.34	
The Dalles	92	39	64.7	0.61	
Toledo	84	36	58.4	2.13	
Umatilla	97	41	67.1	0.15	
Vale	96	27	59.7	0.46	
Wallowa	94	24	57.9	0.67	
Wamic	90	35	63.3	1.09	
Warm Spring	97	34	62.4	0.28	
Weston	95	29	61.2	0.68	
Williams	93	36	62.3	0.30	
Pennsylvania.					
Aleppo	89	32	65.8	1.63	
Altoona	88	25	62.8	1.73	
Beaver Dam	.....	.....	.....	1.13	
Bellefonte	88	29	55.0	1.75	
Brookville	.....	.....	.....	1.06	
Browers	.....	.....	.....	4.81	
California	91	33	67.6	1.31	
Cassandra	84	27	60.3	2.30	
Centerhall	88	26	61.5	1.26	
Clarion	.....	.....	.....	1.00	
Claysville	90	33	65.8	2.24	
Coatsville	90	30	65.6	5.67	
Coudersport	84	23	59.4	5.09	
Confluence	.....	.....	.....	1.20	
Davis Island Dam	.....	.....	.....	3.14	
Derry	88	28	65.4	1.45	
Doylestown	.....	.....	.....	3.74	
Dushore	86	23	59.4	3.18	
East Bloomsburg	.....	.....	.....	3.96	
East Mauch Chunk	89	28	63.0	3.10	
Easton	86	33	63.8	4.92	
Ellwood Junction	.....	.....	.....	1.85	
Emporium	86	28	61.0	4.59	
Ephrata	90	30	65.0	3.69	
Everett	88	28	63.4	3.47	
Forks of Neshaminy	.....	.....	.....	4.80	
Franklin	87	26	63.4	2.35	
Freeport	91	30	66.5	2.38	
Gettysburg	88	34	66.2	2.78	
Girardville	.....	.....	.....	6.50	
Gordon	89	25	61.8	7.40	
Greensboro	.....	.....	.....	1.20	
Greenville	88	26	62.2	2.59	
Hamburg	90	31	65.6	4.92	
Herrs Island Dam	.....	.....	.....	2.79	
Huntingdon *a*	.....	.....	.....	0.79	
Huntingdon *b*	92	28	64.9	0.84	
Indiana	87	27	64.4	1.79	
Irwin	95	29	68.1	1.08	
Johnstown	92	31	66.0	2.29	
Keating	.....	.....	.....	4.23	
Kennett Square	84	34	64.4	5.32	
Lansdale	.....	.....	.....	4.54	
Lawrenceville	89	23	59.3	2.30	
Pennsylvania—Cont'd.					
Lebanon	91	30	65.5	3.81	
Leroy	85	28	60.4	3.53	
Lewisburg	91	29	63.6	3.41	
Lockhaven *a*	92	29	65.2	1.95	
Lockhaven *b*	.....	.....	.....	2.03	
Lock No. 4	.....	.....	.....	0.82	
Lycippus	86[j]	33	66.2[e]	1.31	
Marion	90	31	65.0	1.88	
Mifflin	.....	.....	.....	1.65	
Mifflintown	90	28	64.4	1.56	
Milford	89	25	60.6	5.27	
Montrose	84	26	59.2	3.91	
New Germantown	91	27	64.5	1.62	
Oil City	.....	.....	.....	2.66	
Ottsville	.....	.....	.....	6.02	
Parker	.....	.....	.....	1.24	
Philadelphia	87	38	67.4	6.98	
Pocono Lake	80	24	57.4	4.79	
Point Pleasant	.....	.....	.....	6.11	
Pottsville	.....	.....	.....	4.50	
Quakertown	89	29	64.2	6.46	
Reading	88	33	66.0	2.46	
Saegerstown	87	21	61.2	3.61	
St. Marys	84	25	60.4	4.08	
Saltsburg	.....	.....	.....	1.79	
Seisholtzville	.....	.....	.....	4.07	
Selinsgrove	90	30	66.6	4.68	
Shawmont	.....	.....	.....	3.65	
Skidmore	87	26	63.4	1.41	
Smethport	87	21	59.1	6.36	
Smiths Corners	.....	.....	.....	6.35	
Somerset	85	25	62.0	2.72	
South Eaton	86	30	61.9	3.71	
Springmount	.....	.....	.....	6.71	
State College	85	28	62.6	1.86	
Swarthmore	87	33	65.7	5.08	
Towanda	88	27	61.2	4.70	
Troutrun	.....	.....	.....	2.95	
Uniontown	89	35	66.8	1.99	
Warren	86	26	61.2	4.28	
Wellsboro	87	26	61.0	.....	
Westchester	87	34	66.2	7.05	
West Newton	.....	.....	.....	1.11	
Wilkesbarre	89	31	63.0	3.34	
Williamsport	88	31	63.7	2.60	
Rhode Island.					
Bristol	79	35	62.2	2.23	
Kingston	82	29	60.6	1.97	
Providence *a*	86	35	64.2	5.34	
Providence *c*	84	33	62.2	5.51	
South Carolina.					
Aiken	98	51	77.6	0.40	
Allendale	95	55	76.6	2.30	
Anderson	101	50	75.6	0.63	
Barksdale	94	48	74.4	0.19	
Batesburg	99	49	76.2	1.22	
Beaufort	96	60	76.3	4.44	
Bennettsville	95	57	78.6	3.55	
Blackville	98	50	76.4	3.17	
Bowman	96	50	75.1	0.93	
Calhoun Falls	.....	.....	.....	0.70	
Camden	.....	.....	.....	1.76	
Cheraw *a*	96	46	72.4	4.18	
Cheraw *b*	.....	.....	.....	4.80	
Clarks Hill	95	51	75.2	0.46	
Clemson College	94	46	73.1	1.89	
Conway	92	50	73.8	5.55	
Dillon	95	47	74.2	8.66	
Edisto	.....	.....	.....	2.10	
Effingham	.....	.....	.....	6.85	
Florence	95	48	73.8	5.46	
Gaffney	96	45	73.6	2.08	
Georgetown	91	54	74.4	5.95	
Greenville	90	44	69.6	2.45	
Greenwood	92	49	73.6	1.79	
Heath Springs	92	54	74.6	1.46	
Kingstree *a*	96	49	74.2	2.06	
Kingstree *b*	.....	.....	.....	2.15	
Liberty	94	48	73.6	0.44	
Little Mountain	96	49	75.6	T.	
Newberry	98	47	74.4	0.30	
Pelzer	.....	.....	.....	0.30	
Pinopolis*[1]	88	56	73.4	0.91	
St. Georges	95	53	74.8	0.93	
St. Matthews	96	52	73.9	2.55	
St. Stephens	.....	.....	.....	1.96	
Saluda	95	45	74.5	1.00	
Santuck	95	44	73.2	1.00	
Seivern	97	46	74.5	3.84	
Smiths Mills	.....	.....	.....	9.50	
Society Hill	90	49	72.5	6.86	
Spartanburg	95	48	74.0	1.47	
Statesburg	93	50	74.4	4.30	
Summerville	91	55	73.8	2.81	
Trenton	94	50	75.3	0.68	
Trial	95	51	74.2	1.75	
Walhalla	94	47	72.5	1.05	
Walterboro	96	55	74.9	4.04	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
South Carolina—Cont'd.	°	°	°	*Ins.*	*Ins.*
Winnsboro	94	50	74.7	0.80	
Winthrop College	92[f]	45	73.1[e]	0.45	
Yemassee	97	54	75.3	1.86	
Yorkville	94	46	73.8	0.46	
South Dakota.					
Aberdeen	95	26	58.6	3.90	
Academy	105	33	63.6	0.25	
Alexandria	105	34	61.6	2.02	
Armour	109	29	63.8	0.59	
Ashcroft	96	22	54.7	0.07	
Bowdle	91	26	59.0	2.05	
Brookings	100	23	59.0	0.93	
Canton	95	31	61.4	1.65	
Cavite	107	30	63.0	0.00	
Centerville				0.61	
Chamberlain	108	34	65.0	0.26	
Cheyenne	100	27	60.7	0.60	
Clark	99	25	58.0	2.03	
Clear Lake	95	30	58.4	2.10	
DeSmet	105[e]	26[e]	60.0[e]	0.10	
Doland	100	28	61.0	0.83	
Elkpoint	97	37	65.8	1.10	
Fairfax	102	30	64.9	0.77	
Farmingdale				1.01	
Faulkton	93	24	58.8	1.51	
Flandreau	82	30	58.0	0.80	
Forestburg	103	26	61.4	0.73	
Fort Meade	96	22	60.7	0.45	
Grand River School	98	27	60.0	1.14	
Greenwood	103	35	64.9	0.99	
Herreid	94[d]	26[d]	59.3[d]	2.37	
Highmore	105	27	61.4	0.38	
Hotch City	110	28	63.1	0.00	
Howard	104	31	62.2	0.45	
Howell	105	21	59.0	0.58	
Ipswich	90	25	57.0	4.21	
Kidder[d]	92	25	56.2		
Kimball				0.17	
Leola	90[e]	24[e]	56.4[e]	3.95	
Leslie	102	26	63.2	0.58	
Marion	92	31	62.0	0.79	
Mellette	99	27	59.0	3.55	
Menno	103	33	62.5	0.74	
Millbank	101	24	58.2	1.67	
Mitchell	105	31	62.0	0.63	
Oelrichs	98	22	60.0	1.00	
On-the-Trees Camp	96	28	60.2	0.72	
Plankinton	104	29	61.5	0.16	
Ramsey	102	26	60.0	0.73	
Redfield	104	25	58.2	0.98	
Sioux Falls	101	30	63.0	0.66	
Sisseton Agency	89	28	57.2	2.73	
Spearfish	92	27	60.8	0.20	
Stephan	108[e]	28[e]	62.1[e]	0.19	
Tyndall	101	32	62.4	0.51	
Vermillion	101[e]	38	65.4[d]	0.55	
Watertown	95	29	57.8	1.87	
Wentworth	105	29	61.6	0.84	
Wolsey				0.28	
Tennessee.					
Andersonville	82	43	70.2	2.47	
Arlington	96	41	73.9	2.68	
Ashwood	95	38	73.8	2.30	
Benton	96	42	72.8	0.27	
Bluff City				1.83	
Bolivar	95	40	73.0	2.46	
Bristol	90	41	68.8	T.	
Brownsville	93	45	73.4	2.75	
Byrdstown	94	41	71.8	0.69	
Carthage	96	48	72.8	1.92	
Cedar Hill	96	41	73.8	1.22	
Celina				1.02	
Charleston				1.08	
Clarksville	94	44	73.6	1.72	
Clinton				1.07	
Covington	92	42	74.0	1.53	
Decatur	95	41	72.1	2.31	
Dickson	96[d]	34[d]	72.6[d]	2.05	
Dover	99	40	73.7	4.02	
Dyersburg	93	44	73.4	4.96	
Elizabethton	91	44	67.6	1.26	
Erasmus	91	34	66.9	2.71	
Florence	91	40	72.6	2.58	
Franklin	98	42	73.3	1.43	
Greeneville	89	43	70.0	1.37	
Halls Hill				1.86	
Harriman	92	50	72.4	1.15	
Hohenwald	97	31	71.0	1.84	
Iron City	96	44	73.4	1.35	
Isabella	90	43	70.4	0.62	
Jackson	96[l]	39	73.4[f]	1.85	
Johnsonville	96	39	73.0	3.12	
Jonesboro	92	40	70.4	1.01	
Kenton	96	41	72.8	2.92	
Kingston				1.48	
Lafayette	96	37	72.1	1.31	
Leadvale				1.20	
Lewisburg	99	38	75.0	3.38	
Tennessee—Cont'd.	°	°	°	*Ins.*	*Ins.*
Loudon				2.30	
Lynnville	92	41	73.6	2.56	
McMinnville	95	40	72.0	2.39	
Maryville	95	43	72.6	2.73	
Milan	94	41	72.9	3.12	
Monterey	89	45[f]	71.4[e]	1.88	
Newport	91	44	70.6	1.42	
Nunnelly	97	34	73.4	1.43	
Palmetto	94	41	73.4	1.89	
Pope	100	38	74.8	1.90	
Rogersville	92	43	70.8	1.90	
Rugby	93	34	68.7	2.55	
Savannah	98	41	76.3	4.22	
Sewanee	90	46	71.3	0.41	
Silverlake	82[e]	38[f]	63.2[h]	1.44	
Springdale	92	37	70.8	3.34	
Springville	96	39	72.2	4.08	
Tazewell				2.05	
Tellico Plains	96	42	73.0	1.19	
Tracy City	90	36	67.5	0.98	
Trenton	96	39	73.4	4.50	
Tullahoma	93	38	71.7	2.58	
Waynesboro	98	38	74.0	2.40	
Wildersville	88	43	72.0	3.15	
Yukon	95	45	74.2	1.24	
Texas.					
Albany	101			2.51	
Alvin				2.22	
Athens	100	58	80.5	2.00	
Austin	96	64	80.8	3.81	
Ballinger	99	50	75.3	2.71	
Beaumont	101	68	84.3	3.19	
Beeville	100	67	81.3	4.93	
Bigspring	101	56	75.4	3.45	
Blanco	96	58	76.8	5.75	
Boerne	93	60	76.0	8.83	
Bonham	101	52	78.3	2.41	
Booth				1.67	
Bowie	102	54	77.0	4.24	
Brazoria	91	64	79.3	4.25	
Brenham	93	61	79.3	2.77	
Brighton	91	69	81.2	6.82	
Brownwood	100	60	78.2	0.70	
Burnet	98	58	78.2	3.45	
Channing	94	46	70.0	4.05	
Claytonville	100	54	73.0	4.62	
Coleman	95[h]	61[h]	76.2[h]	1.27	
College Station	98	65	80.8	0.75	
Colorado	105	55	75.6	6.07	
Columbia	90	61	78.8	4.51	
Columbus				4.12	
Comstock	97	62	77.4	9.60	
Corsicana	99	58	80.1	5.57	
Cotulla	98	68	82.1	5.35	
Crockett	97	60	79.6	2.05	
Cuero	99	67	81.0	6.03	
Dallas	103	58	79.0	3.73	
Danevang	97	64	80.4	4.53	
Dialville	92	59[d]	77.6	3.87	
Dublin	98	56	79.2	1.25	
Duval	95	65	79.4	1.40	
Estelle	102	59	79.2	2.58	
Fort Brown	95	71	82.2	4.50	
Fort Clark	98	67	77.8	10.68	
Fort Davis	92	49	66.4	7.86	
Fort McIntosh	103	69	83.5	6.55	
Fort Ringgold	101	67	82.8	5.90	
Fort Stockton	103	54	72.0	2.39	
Fredericksburg	97[e]	60[e]	78.1[e]	5.62	
Gainesville	99[e]	52[e]	77.9[e]	0.83	
Gatesville		58		2.95	
Georgetown	97	59	79.6	4.37	
Graham	99	51	77.0	1.87	
Grapevine	104	57	79.6	3.54	
Greenville	101	55	80.8	1.10	
Hale Center	98	51	70.6	5.10	
Hallettsville	97	66	81.0	2.16	
Haskell	102	53	76.3	4.58	
Hearne	99	62	81.3	3.22	
Hempstead				6.06	
Henrietta	102	49	77.1	4.34	
Hewitt				1.28	
Hillsboro	100	55	79.0	4.30	
Hondo	99	67	79.9	9.02	
Houston	94	66	81.6	1.20	
Huntsville	98	62	81.8	1.34	
Ira	100	55	74.2	5.03	
Jefferson	94	55	77.1	1.64	
Jewett	95	58	78.5	1.55	
Kaufman	100	58	80.0	2.05	
Kent	100	47	68.7	6.00	
Kerrville	95	56	76.2	7.79	
Knickerbocker	99	59	75.0	2.35	
Kopperl				6.70	
Lampasas	99	59	78.0	4.65	
Lapara				3.64	
Laureles Ranch				8.50	
Liberty	100			2.00	
Texas—Cont'd.	°	°	°	*Ins.*	*Ins.*
Llano	98	64	76.8	3.70	
Longview	98	58	78.8	2.37	
Luling	98	64	78.9	6.31	
McKinney	99	53	78.2	1.81	
Marlin	99	60	80.3	0.92	
Menardville	96	55	74.4	6.12	
Mexia	98	60[e]	80.2	2.54	
Midland	98[i]	56[f]	74.2[f]	2.95	
Mount Blanco	95	51	71.3	2.21	
Nacogdoches	96	61	88.1	4.68	
New Braunfels	95	64	79.4	5.76	
Orange				1.00	
Panter				2.37	
Paris	102	54	79.6	0.74	
Pearsall	100	68	81.4	4.96	
Pecos	100			4.17	
Pierce	96	67	80.6	2.34	
Port Lavaca	94	68	80.8	4.17	
Rhineland	100	56	74.4	3.33	
Riverside				2.67	
Rockisland	96	65	80.4	2.52	
Rockland	96	69	83.4	2.62	
Rockport	90	60	77.8	8.76	
Runge	100	67	82.2	6.71	
Sabinal	100	66	79.8	10.40	
San Antonio				6.30	
San Saba	98	56	76.6	3.91	
Santa Gertrudes Ranch				5.21	
Sherman	96	57	78.0	1.41	
Sonora	96	60	74.5	3.80	
Sugarland	93	63	78.5	3.23	
Sulphur Springs	98	55	78.2	2.04	
Temple *a*	95	59	77.4	2.86	
Temple *b*	97	60	79.4	3.11	
Texline	91	46	66.8	3.41	
Tilden	102			6.30	
Trinity	99	61	80.8	2.86	
Tulia	97	45	70.8	3.35	
Tyler	97	61	79.0	3.62	
Victoria	96	67	81.1	4.32	
Waco	100	62	81.7	1.48	
Waxahachie	103	56	78.8	3.70	
Weatherford	99	57	77.7	2.32	
Wharton	99	60	80.7	4.42	
Wichita Falls				7.58	
Utah.					
Beaver	89	28	59.1	0.38	
Blackrock	85	28	58.1	0.30	
Blacksmith Fork				0.49	
Callao	97	32	62.6	0.36	
Castledale	86	25	57.4	0.30	
Castle Rock				0.06	
Cisco	95	31	69.1	0.20	
Corinne	96	37[g]	64.2[d]	0.80	
Coyoto	86[f]	20[f]	50.0[f]	0.40	
Emery	74	28	52.1	0.76	
Escalante	89	33	62.0	1.61	
Experiment Farm	102	31	67.2		
Farmington	89	33	60.7	0.03	
Fillmore	100	32	67.1	0.10	
Fort Duchesne	92	29	59.9	0.32	
Frisco	89	36	63.4	0.45	
Garrison	91	30	62.8	0.55	
Giles	94	37	65.0	0.88	
Government Creek	91	31	62.4	0.22	
Green River	97	35	66.5	0.26	
Heber	90	26	56.6	0.16	
Henefer	90	24	56.8	0.06	
Hite	100	48	74.1	0.55	
Huntsville				0.10	
Ibapah	90	25	56.6	0.58	
Indianola				0 25	
Kanab	90[g]	26[g]	59.4[g]	0.70	
Kelton	84	33	58.1		
La Sal	81	27	58.9	0.66	
Levan	86	36	61.0	0.27	
Loa	84	20	56.6	0.20	
Logan	93	35	64.0	0.17	
Manti	90	34	59.6	0.48	
Marysvale	88	27	57.8	0.98	
Meadowville	80[i]	30	54.9[e]	0.40	
Millville				0.30	
Minersville	91	34	64.0		
Moab	95	34	68.0	0.25	
Monticello	84	39	61.4	1.37	
Mount Nebo	93	34	64.2	0.16	
Mount Pleasant	90	33	62.2	0.36	
Morgan	87	27	57.1	0.02	
Nephi				0.18	
Ogden	85	40	64.3	0.09	
Panquitch				1.57	
Park City	81[f]	29[f]	54.0[f]	0.48	
Parowan	89	31	60.6	0.17	
Payson				0.13	
Pine Valley				1.52	
Pinto	87	27	57.0	0.99	
Plateau	86	22	55.0	0.50	
Promontory *[1]	83	30	52.6		

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Utah—Cont'd.	°	°	°	*Ins.*	*Ins.*
Provo	94	34	62.1	0.04	
Ranch	86	25	55.8	0.27	
Randolph	.....	.....	.....	0.19	
Richfield	90[b]	28[b]	61.1[b]	0.05	
Rockville	102	37	73.6	0.86	
St. George	102	34	68.6	0.34	
Salt Air	88	44	66.5	0.33	
Scipio	92	28	60.2	0.30	
Snowville	92	30	59.1	0.28	
Soldier Summit	81	25	51.4	0.62	
Thistle	96	29	63.8	1.90	
Tooele	87	37	65.6	0.17	
Tropic	88	26	60.2	T.	
Utah Lake	.....	.....	.....	0.18	
Wellington	93[c]	28[c]	60.4[c]	T.	
Woodruff	90	20	55.0	.....	
Vermont.					
Burlington	77	38	57.8	5.84	
Cavendish	84	22	54.8	8.24	
Chelsea	78	23	52.6	5.90	
Chittenden	.....	.....	.....	7.98	
Cornwall	83	28	58.6	3.53	
Derby	80	29	52.4	6.30	T.
Enosburg Falls	80	24	54.4	5.45	
Jacksonville	80	20	53.4	6.05	
Manchester	82	24	56.4	7.42	
Morrisville	81	21	54.2	5.54	
Norwich	81	20	54.4	6.01	
St. Johnsbury	82	22	55.6	5.15	T.
Wells	83	26	55.6	6.10	
Westfield	88[c]	24	53.8	5.10	T.
Woodstock	88	22	51.0	5.86	
Virginia.					
Ashland	94	36	69.0	4.42	
Barboursville	89[c]	35[c]	69.3[c]	1.53	
Bedford	.....	35	.....	1.37	
Bigstone Gap	89	40	68.3	0.93	
Blacksburg	88	33	64.2	0.27	
Buckingham	92	33	67.5	3.34	
Buchanan	.....	.....	.....	1.32	
Burkes Garden	82	28	60.0	2.53	
Callaville	92	39	70.6	5.88	
Charlottesville	93	37	69.6	2.16	
Columbia	90	35	67.2	4.50	
Dale Enterprise	90	32	66.0	1.26	
Danville	.....	.....	.....	3.93	
Elk Knob	85	45	69.2	1.16	
Farmville	90	32	67.0	.....	
Fredericksburg	91	34	68.0	4.09	
Grahams Forge	86	35	65.1	1.02	
Hampton	88	49	72.0	2.93	
Hot Springs	83	34	62.4	1.81	
Ivanhoe	.....	.....	.....	1.32	
Lexington	91	36	67.5	1.88	
Lincoln	94	30	67.4	1.84	
McDowell	90	35	64.3	0.19	
Mendota	.....	.....	.....	2.54	
Newport News	89	46	72.1	4.12	
Petersburg	91	38	70.4	2.41	
Radford	.....	.....	.....	0.12	
Riverton	.....	.....	.....	1.91	
Roanoke	94	38	69.0	2.16	
Rockymount	.....	37	.....	1.22	
Saxe	93	35	69.0	1.62	
Shenandoah	.....	.....	.....	1.52	
Speers Ferry	.....	.....	.....	1.31	
Spottsville	92	37	69.3	3.46	
Staunton	90	34	68.0	1.77	
Stephens City	95	31	68.4	3.47	
Warsaw	95	33	71.0	4.02	
Wilkerson	93	37	71.0	5.07	
Woodstock	96	31	69.2	1.81	
Wytheville	92	36	67.0	0.73	
Washington.					
Aberdeen	86	36	60.0	1.02	
Anacortes	.....	.....	.....	0.76	
Ashford	.....	.....	.....	2.23	
Bellingham	80	34	56.4	1.44	
Blaine	77	32	54.6	1.72	
Brinnon	87	40	60.2	0.23	
Cedonia	95	40	62.9	0.12	
Centralia	94	31	59.9	0.22	
Cheney	93	33	60.8	0.06	
Clearbrook	84	31	57.2	1.92	
Clearwater	82	35	58.0	3.07	
Cle Elum	91	25	57.8	0.78	
Colfax	91	26	58.0	0.06	
Conconully	86	30	57.4	T.	
Coupeville	83	42	57.6	0.28	
Crescent	93	33	60.0	0.02	
Cusick	91	24	55.6	0.38	
Danville	90	30	58.9	0.08	
Dayton	94	36	64.8	0.25	
East Sound	82	32	55.0	1.31	
Ellensburg	86	29	58.8	0.20	
Ephrata	95	42	67.5	0.00	
Granite Falls	.....	.....	.....	0.70	
Horseheaven	.....	.....	.....	0.27	
Washington—Cont'd.	°	°	°	*Ins.*	*Ins.*
Kennewick	99	38	65.5	0.10	
Lacenter	91	37	61.2	0.62	
Lakeside	93	44	66.1	0.02	
Lester	85	31	59.0	0.53	
Lind	93	43	66.6	0.03	
Loomis	92	41	65.4	T.	
Mottinger Ranch	99	44	68.0	0.35	
Mount Pleasant	90	36	62.5	0.25	
Moxee	94	32	61.6	0.10	
Northport	89[c]	23[c]	54.8[c]	0.11	
Odessa	93	30	60.0	0.00	
Olga	77	48	57.3	0.98	
Olympia	89	35	60.3	0.21	
Pinehill	93	38	64.2	0.60	
Pomeroy	95	31	61.6	T.	
Port Townsend	78	45	58.6	0.25	
Pullman	90[c]	35[c]	61.6[d]	0.20	
Republic	89	27	56.6	0.00	
Ritzville	.....	.....	.....	0.00	
Ritzville (near)	.....	.....	.....	0.10	
Rosalia	90	26	58.9	0.03	
Sedro	82	35	57.2	1.37	
Silvana	86	32	57.2	0.25	
Snohomish	84	39	57.4	0.50	
Snoqualmie	88	37	58.6	0.75	
Southbend	89	40	63.2	0.92	
South Ellensburg	92	30	60.3	0.10	
Sprague	.....	.....	.....	0.00	
Sunnyside	90	37	62.2	0.28	
Trinidad	100	45	69.3	0.00	
Twisp	94	33	61.0	0.24	
Union	87[c]	33	59.2	0.18	
Vancouver	92	37	60.0	0.21	
Vashon	86	38	59.4	0.36	
Waterville	88	37	59.6	0.19	
Wenatchee (near)	90	39	62.2	0.15	
Wilbur	90	31	58.6	0.00	
Zindel	98	49	71.0	0.66	
West Virginia.					
Bancroft	93	42	71.2	1.25	
Bayard	85	25	60.8	1.77	
Bens Run	92	39	69.0	2.43	
Berkeley Springs	85[d]	31[d]	64.8[d]	2.06	
Beverly	88	36	63.8	2.79	
Bluefield	86	40	65.4	1.32	
Burlington	91	28	62.4	2.35	
Cairo	92	32	67.6	1.32	
Central	92	35	66.8	1.65	
Charleston	91	45	70.1	1.51	
Creston	.....	.....	.....	0.60	
Cuba	93	36	67.5	0.46	
Doane	90	43	70.3	2.13	
Elkhorn	87	41	67.2	0.50	
Fairmont	.....	.....	.....	1.69	
Glenville	94	36	68.8	0.84	
Grafton	90	37	67.4	2.94	
Green Sulphur Springs	89	35	65.0	1.24	
Hamlin	93	30	70.3	1.45	
Harpers Ferry	.....	.....	.....	2.33	
Hinton	.....	.....	.....	1.19	
Huntington	93	42	69.4	1.12	
Leonard	81	42	66.3	0.90	
Lewisburg	86	36	65.0	1.37	
Lillydale	90	34	66.8	0.77	
Logan	88	44	68.8	2.19	
Lost Creek	88	32	66.5	0.43	
Mannington	89	34	65.6	2.38	
Martinsburg	93	34	66.2	4.00	
Moorefield	94	29	68.9	1.77	
Morgantown	88	34	67.6	1.38	
Moundsville	89	36	67.2	1.28	
New Cumberland	88	30	64.0	1.53	
New Martinsville	94	38	69.8	1.92	
Nuttallburg	88	40	68.0	0.65	
Parsons	88	31	64.4	2.77	
Philippi	90	32	65.8	2.82	
Pickens	85	36	63.8	2.83	
Point Pleasant	95	44	70.8	1.11	
Princeton	85	36	65.0	1.45	
Romney	92	35	66.8	2.58	
Rowlesburg	.....	.....	.....	4.87	
Ryan	93	34	66.6	1.40	
Southside	93	39	68.4	0.56	
Terra Alta	87	31	64.2	4.48	
Uppertract	91	31	66.9	1.24	
Valley Fork	91[g]	38[g]	68.8[g]	1.27	
Wellsburg	86	32	64.2	1.34	
Weston	93	33	68.2	1.02	
Wheeling *a*	.....	.....	.....	0.92	
Wheeling *b*	92	40	71.8	0.90	
Williamson	91	45	70.7	4.55	
Wisconsin.					
Amherst	87	27	57.4	2.63	
Antigo	79	27	57.0	7.41	
Appleton	85	31	60.9	3.65	
Appleton Marsh	86	28	57.7	5.26	
Ashland	.....	.....	.....	4.09	
Barron	78	30	58.6	6.76	
Wisconsin—Cont'd.	°	°	°	*Ins.*	*Ins.*
Beloit	85	37	62.0	5.95	
Berlin	87	30	59.2	3.94	
Brodhead	87	33	63.3	5.22	
Burnett	85	32	60.3	4.76	
Butternut	79	21	55.5	3.18	
Chilton	84	30	63.6	5.64	
Chippewa Falls	.....	.....	.....	0.40	
Citypoint	86	26	59.0	4.55	
Cranberry Exp. Station	87	18	55.5	4.39	
Darlington	86	30	61.4	6.21	
Dodgeville	84	35	63.0	1.90	
Downing	87	26	58.2	4.20	T.
Easton	86	29	61.0	4.90	
Eau Claire	84	33	60.4	3.66	
Florence	79	23	53.8	4.38	
Fond du Lac	87	28	60.2	5.37	
Grand Rapids	85	29	60.2	3.78	
Grand River Locks	.....	.....	.....	5.35	
Grantsburg	81	25	57.2	7.23	
Hancock	84	33	59.9	5.50	
Harvey	85	33	60.7	5.75	
Hayward	78	22	54.6	5.60	
Hillsboro	87	29	60.8	7.26	
Koepenick	78	22	55.7	9.20	
Lancaster	89	35	62.6	4.01	
Madison	82	40	61.4	5.93	
Manitowoc	84	34	57.8	3.19	
Meadow Valley	87	26	58.8	5.15	
Medford	83	28	59.4	5.75	
Menasha	.....	.....	.....	2.83	
Minocqua	79	32	59.0	5.61	
Mount Horeb	84	29	60.0	7.43	
Neillsville	86	30	58.8	6.82	
New London	87	29	59.4	4.55	
Oconto	87	29	58.8	4.13	
Osceola	84	30	57.4	5.66	
Oshkosh	86	37	61.2	4.48	
Pine River	85	29	60.0	5.44	
Portage	84	35	61.8	6.29	
Port Washington	87	35	56.8	4.83	
Prairie du Chien *a*	92	36	63.6	4.08	
Prairie du Chien *b*	.....	.....	.....	4.10	
Prentice	86	22	58.0	4.25	
Racine	88	41	63.0	2.89	
Sheboygan	87	40	60.5	4.80	
Stanley	83	27	58.2	4.84	
Stevens Point	90	28	61.9	.....	
Tomahawk	79	28	55.4	5.98	
Valley Junction	88	28	60.6	5.42	
Viroqua	86	32	61.4	7.18	
Watertown	84	33	59.8	7.22	
Waukesha	84	38	60.6	4.33	
Wausau	79	31	58.2	3.29	
Whitehall	87	31	58.6	4.71	
Wyoming.					
Afton	87	26	54.4	0.25	
Alcova	90	30	60.4	0.57	
Basin	93	31	62.2	0.00	
Bedford	85[1]	23[1]	53.8[1]	.....	
Border	87	23	52.0	0.53	
Buffalo	94	21	56.0	0.10	
Cambria	90	24	60.8	0.14	
Centennial	.....	.....	.....	1.33	
Daniel	83	17	47.3	T.	
Embar	90	27	56.8	0.12	
Evanston	85	24	53.0	0.05	
Fort Laramie	104	25	62.0	1.19	
Fort Washakie	91	30	58.4	0.23	
Freedom	86	19	52.2	0.47	
Griggs	96	25	56.9	0.27	
Hyattville	95	29	61.2	0.00	
Iron Mountain	84	23	56.4	1.34	
Kirtley	92	14	58.2	0.73	
Laramie	83	28	54.4	1.35	
Leo	84	23	54.6	0.25	
Little Medicine	81	19	50.7	0.48	
Lolabama Ranch	82	22	49.4	0.00	
Lusk	92	12	58.9	0.62	
Marquette	93	28	58.2	0.10	
Meeteetse	91[e]	29[f]	56.7[f]	0.03	
Moore	96	22	57.2	1.45	
Moorcroft	96	24	58.2	0.00	
Phillips	92	29	60.5	0.98	
Pine Bluff	95	27	61.0	0.51	
Sheridan	95	.....	.....	0.40	
South Pass City	86	10	49.8	0.07	
Wells	79	20	47.2	0.41	
Yellowstone Park (C. H.)	76	20	44.8	0.06	
Yellowstone Pk. (Foun'n)	80[d]	19[d]	47.5[d]	0.19	
Yellowstone Pk. (Lake)	78	20	47.6	0.26	
Yellowstone Park (Norris)	82	15	48.6	0.75	
Yellowstone Pk. (U. Ba'n)	81	20	48.2	0.74	
Porto Rico.					
Adjuntas	89	57	73.0	14.80	
Aguirre	95	62	81.8	6.50	
Arecibo	91	60	74.2	7.15	
Bayamon	90	60	76.4	6.35	
Caguas	90	65	78.0	12.38	

TABLE II.—*Climatological record of voluntary and other cooperating observers. Late reports for August*—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Porto Rico—Cont'd.	°	°	°	*Ins.*	*Ins.*
Canovanas	90	71	80.4	8.19	
Coamo	91	62	78.7	3.36	
Fajardo	90	69	80.1	9.64	
Guanica	92	64	77.3	4.99	
Hacienda Colosa	91	67	79.2	9.71	
Hacienda Josefa	.....	.....	.....	7.42	
Humacao	89	75	82.4	11.57	
Isabela	89	68	78.6	5.76	
Juana Diaz	89	54	69.9	8.85	
La Carmelita	87	61	75.1	18.56	
La Ysolina	92	65	77.4	7.07	
Lares	93	60	76.6	14.72	
Las Marias	91	65	78.3	19.34	
Manati	95	67	80.1	4.83	
Maunabo	93	69	80.4	10.30	
Mayaguez	92	66	78.8	8.33	
Rio Blanco	88	68	78.4	15.28	
San Lorenzo	94	65	78.5	9.09	
San Salvador	87	65	75.3	9.71	
Santa Isabel	94	68	79.2	5.80	
Vieques	90	70	80.2	6.10	
Yauco	90	69	79.4	4.77	
New Brunswick.					
St. John	67	34	52.7	4.81	
West Indies.					
Nassau, Bahamas	91	70	80.4	7.06	

Late reports for August, 1904.

Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Alaska.					
Chestochena	86	27	53.4	0.40	
Coal Harbor	60	41	49.8	4.17	
Copper Center	87	24	52.2	2.09	
Fort Gibbon	.....	.....	.....	3.80	
Fort Liscum	* 75	34	49.2	12.45	
Juneau	74	36	54.2	4.04	
Kenai	73	25	50.8	3.50	
Alaska—Cont'd.	°	°	°	*Ins.*	*Ins.*
Ketchemstock	75	28	53.0	0.94	
Sunrise	76	31	51.4	5.02	
Tanana	79	23	48.2	0.89	
Teikhill	100	25	51.6	2.00	
Wood Island	68	42	53.6	4.89	
Wrangell	75	39	55.4	1.84	
California.					
Kernville	.....	.....	.....	0.27	
Nimshew	110	42	77.4	0.00	
Ventura	83	54	67.8	0.09	
West Point	.....	.....	.....	T.	
Colorado.					
Fox	94	38	70.6	2.06	
Georgia.					
Resaca	.....	.....	.....	3.81	
Iowa.					
Sigourney	95	46	70.8	3.62	
Kentucky.					
Mayfield	91c	58c	75.9c	3.24	
Minnesota.					
Alexandria	92	42	64.4	1.77	
North Carolina.					
Highlands	80	46	65.2	7.87	
Southern Pines *b*	98	54	78.0	10.35	
Ohio.					
Colebrook	.....	.....	.....	3.36	
Lima	90	48	71.0	2.93	
South Carolina.					
Lugoff	.....	.....	.....	3.37	
Texas.					
Kopperl	.....	.....	.....	0.00	
Washington.					
Granite Falls	.....	.....	.....	0.42	
Mottinger Ranch	109	50	76.8	0.00	
Porto Rico.					
Hacienda Coloso	92	65	79.5	5.44	
Mexico.					
Coatzacoalcos	.....	.....	.....	10.80	
Vera Cruz	90	69	78.6	16.38	

EXPLANATION OF SIGNS.

*** Extremes of temperature from observed readings of dry thermometer.**

A numeral following the name of a station indicates the hours of observation from which the mean temperature was obtained, thus:

[1] Mean of 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. ÷ 4.
[2] Mean of 8 a. m. + 8 p. m. ÷ 2.
[3] Mean of 7 a. m. + 7 p. m. ÷ 2.
[4] Mean of 6 a. m. + 6 p. m. ÷ 2.
[5] Mean of 7 a. m. + 2 p. m. ÷ 2.
[6] Mean of readings at various hours reduced to true daily mean by special tables.

The absence of a numeral indicates that the mean temperature has been obtained from daily readings of the maximum and minimum thermometers.

An italic letter following the name of a station, as "Livingston *a*," "Livingston *b*," indicates that two or more observers, as the case may be, are reporting from the same station. A small roman letter following the name of a station, or in figure columns, indicates the number of days missing from the record; for instance, "n" denotes 14 days missing.

No note is made of breaks in the continuity of temperature records when the same do not exceed two days. All known breaks of whatever duration, in the precipitation record receive appropriate notice.

CORRECTIONS.

August, 1904, Montana, Dayton, make mean temperature 69.5 instead of 69.7; New Mexico, Dorsey, make mean temperature 67.8 instead of 69.6.

Page 361, Table 3, square 66, February, make 15 read 18.

TABLE III.—*Resultant winds from observations at 8 a. m. and 8 p. m., daily, during the month of September, 1904.*

Stations.	Component direction from— N.	S.	E.	W.	Resultant. Direction from—	Duration.
New England.	Hours.	Hours.	Hours.	Hours.	°	Hours.
Eastport, Me	16	24	6	28	s. 70 w.	23
Portland, Me	17	31	9	19	s. 36 w.	17
Concord, N. H. †	11	9	12	7	n. 68 e.	5
Northfield, Vt	15	37	9	10	s. 3 w.	22
Boston, Mass	13	25	11	26	s. 51 w.	19
Nantucket, Mass	12	24	20	15	s. 23 e.	13
Block Island, R. I	17	20	17	20	s. 45 w.	4
Narragansett, R. I.*	6	8	9	13	s. 63 w.	4
New Haven, Conn	22	22	14	17	w.	3
Middle Atlantic States.						
Albany, N. Y	18	30	8	11	s. 14 w.	12
Binghamton, N. Y. †	7	7	14	7	e.	7
New York, N. Y	16	19	19	14	s. 59 e.	6
Harrisburg, Pa	17	14	24	16	n. 69 e.	8
Philadelphia, Pa	18	20	21	15	s. 72 e.	6
Scranton, Pa	25	16	18	18	n.	9
Atlantic City, N. J	19	17	17	19	n. 45 w.	3
Cape May, N. J	23	21	14	14	n.	2
Baltimore, Md	24	19	19	14	n. 45 e.	7
Washington, D. C	22	22	18	8	e.	10
Cape Henry, Va. †	8	15	12	1	s. 58 e.	13
Lynchburg, Va	19	16	15	23	n. 69 w.	8
Norfolk, Va	20	24	20	10	s. 68 w.	11
Richmond, Va	22	24	16	13	s. 56 e.	4
Wytheville, Va	13	12	17	28	n. 85 w.	11
South Atlantic States.						
Asheville, N. C	16	23	20	13	s. 45 e.	10
Charlotte, N. C	19	20	20	14	s. 80 e.	6
Hatteras, N. C	27	10	25	16	n. 28 e.	19
Raleigh, N. C	24	15	20	16	n. 24 e.	10
Wilmington, N. C	24	14	18	19	n. 6 w.	10
Charleston, S. C	20	20	23	10	e.	13
Columbia, S. C	16	17	27	13	s. 86 e.	14
Augusta, Ga	23	17	26	11	n. 68 e.	16
Savannah, Ga	22	16	22	13	n. 56 e.	11
Jacksonville, Fla	27	11	24	11	n. 39 e.	21
Florida Peninsula.						
Jupiter, Fla	13	17	41	4	s. 84 e.	37
Key West, Fla	16	5	46	3	n. 76 e.	44
Sand Key, Fla. †	9	4	23	2	n. 77 e.	22
Tampa, Fla	31	5	35	4	n. 50 e.	40
Eastern Gulf States.						
Atlanta, Ga	19	18	23	14	n. 84 e.	9
Macon, Ga. †	14	8	9	4	n. 40 e.	8
Pensacola, Fla. †	19	2	11	7	n. 13 e.	18
Birmingham, Ala. †	9	8	15	3	n. 85 e.	12
Mobile, Ala	26	22	10	16	n. 56 w.	7
Montgomery, Ala	28	16	22	7	n. 51 e.	19
Meridian, Miss. †	10	10	10	9	e.	1
Vicksburg, Miss	20	18	22	15	n. 74 e.	7
New Orleans, La	14	22	33	5	s. 74 e.	29
Western Gulf States.						
Shreveport, La	16	25	26	10	s. 61 e.	18
Fort Smith, Ark	15	12	36	5	n. 84 e.	31
Little Rock, Ark	19	22	17	15	s. 34 e.	4
Corpus Christi, Tex	9	22	38	3	s. 70 e.	37
Fort Worth, Tex	17	29	21	7	s. 49 e.	18
Galveston, Tex	10	33	26	3	s. 45 e.	32
Palestine, Tex	15	27	23	5	s. 56 e.	22
San Antonio, Tex	7	33	32	1	s. 50 e.	40
Taylor, Tex. †	8	16	10	2	s. 45 e.	11
Ohio Valley and Tennessee.						
Chattanooga, Tenn	20	17	11	24	n. 77 w.	13
Knoxville, Tenn	22	19	9	27	n. 81 w.	18
Memphis, Tenn	26	18	13	17	n. 27 w.	9
Nashville, Tenn	22	23	13	16	s. 72 w.	3
Lexington, Ky. †	4	15	11	7	s. 20 e.	12
Louisville, Ky	18	25	14	18	s. 30 w.	8
Evansville, Ind. †	12	10	6	8	n. 45 w.	3
Indianapolis, Ind	21	26	9	16	s. 54 w.	9
Cincinnati, Ohio	17	19	18	20	s. 45 w.	3
Columbus, Ohio	13	24	17	17	s.	11
Pittsburg, Pa	23	21	13	20	n. 74 w.	7
Parkersburg, W. Va	18	23	10	20	s. 63 w.	11
Elkins, W. Va	29	13	4	25	n. 53 w.	26
Lower Lake Region.						
Buffalo, N. Y	14	22	15	21	s. 37 w.	10
Oswego, N. Y	12	29	16	14	s. 7 e.	17
Rochester, N. Y	10	25	13	27	s. 43 w.	20
Syracuse, N. Y	15	27	8	18	s. 40 w.	16
Erie, Pa	9	28	15	17	s. 6 w.	19
Cleveland, Ohio	15	25	22	12	s. 34 e.	18
Sandusky, Ohio †	6	13	7	10	s. 23 w.	8
Toledo, Ohio	14	20	18	21	s. 27 w.	7
Detroit, Mich	19	19	14	21	w.	7
Upper Lake Region.						
Alpena, Mich	13	20	14	26	s. 60 w.	14
Escanaba, Mich	21	19	11	20	n. 77 w.	9
Grand Rapids, Mich	12	22	19	17	s. 11 e.	10
Houghton, Mich. †	6	5	13	10	n. 72 e.	3
Marquette, Mich	16	24	10	22	s. 56 w.	14
Port Huron, Mich	15	25	15	20	s. 27 w.	11
Sault Ste. Marie, Mich	15	12	21	25	n. 53 w.	5
Chicago, Ill	16	22	16	21	s. 40 w.	8
Milwaukee, Wis	17	21	11	22	s. 70 w.	12
Green Bay, Wis	13	26	18	17	s. 4 e.	13
Duluth, Minn	25	6	16	28	n. 32 w.	22
North Dakota.						
Moorhead, Minn	23	18	19	17	n. 22 e.	5
Bismarck, N. Dak	26	17	20	11	n. 45 e.	13
Williston, N. Dak	26	13	24	13	n. 40 e.	17

Stations.	Component direction from— N.	S.	E.	W.	Resultant. Direction from—	Duration.
Upper Mississippi Valley.	Hours.	Hours.	Hours.	Hours.	°	Hours.
Minneapolis, Minn.*	11	8	8	10	n. 34 w.	4
St. Paul, Minn	16	18	16	21	s. 68 w.	5
La Crosse, Wis. †	8	14	4	7	s. 27 w.	7
Davenport, Iowa	12	20	12	25	s. 58 w.	15
Des Moines, Iowa	14	24	13	24	s. 48 w.	15
Dubuque, Iowa	14	23	17	20	s. 18 w.	10
Keokuk, Iowa	15	26	12	23	s. 45 w.	16
Cairo, Ill	24	22	12	10	n. 45 e.	3
Springfield, Ill	14	28	11	20	s. 33 w.	17
Hannibal, Mo. †	8	10	5	12	s. 74 w.	7
St. Louis, Mo	15	30	13	12	s. 4 e.	15
Missouri Valley.						
Columbia, Mo. *	7	16	10	5	s. 29 e.	10
Kansas City, Mo	15	31	17	11	s. 21 e.	17
Springfield, Mo	14	32	16	9	s. 21 e.	19
Topeka, Kans.*	7	18	5	3	s. 10 e.	11
Lincoln, Nebr	20	24	21	6	s. 75 e.	16
Omaha, Nebr	21	23	14	12	s. 45 e.	3
Valentine, Nebr	23	13	13	21	n. 39 w.	13
Sioux City, Iowa †	11	11	8	5	e.	3
Pierre, S. Dak	22	15	20	19	n. 8 e.	7
Huron, S. Dak	20	19	21	17	n. 76 e.	4
Yankton, S. Dak. †	8	13	6	11	s. 45 w.	7
Northern Slope.						
Havre, Mont	22	7	16	22	n. 47 w.	22
Miles City, Mont	25	18	12	22	n. 55 w.	12
Helena, Mont	11	18	8	36	s. 76 w.	29
Kalispell, Mont	6	18	14	32	s. 56 w.	22
Rapid City, S. Dak	21	15	15	21	n. 45 w.	8
Cheyenne, Wyo	22	13	9	26	n. 62 w.	19
Lander, Wyo	16	18	14	29	s. 82 w.	15
Yellowstone Park, Wyo	15	30	2	35	s. 66 w.	36
North Platte, Nebr	21	22	15	16	s. 45 w.	1
Middle Slope.						
Denver, Colo	23	25	7	15	s. 76 w.	8
Pueblo, Colo	18	18	19	22	w.	3
Concordia, Kans	19	25	17	9	s. 53 e.	10
Dodge, Kans	12	36	11	8	s. 7 e.	24
Wichita, Kans	12	34	20	3	s. 38 e.	28
Oklahoma, Okla	12	34	15	9	s. 15 e.	23
Southern Slope.						
Abilene, Tex	20	31	18	5	s. 50 e.	17
Amarillo, Tex	10	36	19	8	s. 23 e.	28
Southern Plateau.						
El Paso, Tex	16	7	37	12	n. 70 e.	27
Santa Fe, N. Mex	18	18	28	12	e.	16
Flagstaff, Ariz	35	11	9	17	n. 18 w.	25
Phoenix, Ariz	10	13	28	20	s. 69 e.	8
Yuma, Ariz	14	23	17	22	s. 29 w.	10
Independence, Cal	23	17	10	25	n. 68 w.	16
Middle Plateau.						
Carson City, Nev	9	21	5	35	s. 68 w.	32
Winnemucca, Nev	22	13	19	23	n. 24 w.	10
Modena, Utah	1	5	11	45	s. 83 w.	34
Salt Lake City, Utah	21	18	24	13	n. 75 e.	11
Grand Junction, Colo	13	20	27	12	s. 65 e.	17
Northern Plateau.						
Baker City, Oreg	21	24	21	14	s. 67 e.	8
Boise, Idaho	16	17	12	26	s. 86 w.	14
Lewiston, Idaho †	4	3	22	2	n. 87 e.	20
Pocatello, Idaho	7	22	24	18	s. 22 e.	16
Spokane, Wash	20	15	13	17	n. 39 w.	6
Walla Walla, Wash	6	32	19	19	s.	26
North Pacific Coast Region.						
North Head, Wash	37	11	8	22	n. 28 w.	30
Port Crescent, Wash.*	9	4	6	17	n. 66 w.	12
Seattle, Wash	28	14	13	19	n. 23 w.	15
Tacoma, Wash	35	8	5	18	n. 26 w.	30
Tatoosh Island, Wash	11	24	21	17	s. 17 e.	14
Portland, Oreg	28	16	7	29	n. 61 w.	25
Roseburg, Oreg	29	2	23	11	n. 24 e.	30
Middle Pacific Coast Region.						
Eureka, Cal	23	14	9	23	n. 57 w.	17
Mount Tamalpais, Cal	23	17	6	31	n. 77 w.	26
Red Bluff, Cal	26	21	19	8	n. 66 e.	12
Sacramento, Cal	13	34	18	8	s. 25 e.	23
San Francisco, Cal	5	15	6	44	s. 75 w.	39
Point Reyes Light, Cal.*	14	9	0	17	n. 74 w.	18
Southeast Farallon, Cal.*	......	......	......	......	......	......
South Pacific Coast Region.						
Fresno, Cal	32	11	9	27	n. 41 w.	28
Los Angeles, Cal	12	17	13	33	s. 76 w.	21
San Diego, Cal	27	9	3	36	n. 61 w.	38
San Luis Obispo, Cal	21	16	11	26	n. 72 w.	16
West Indies						
Basseterre, St. Kitts, W. I	12	3	52	1	n. 80 e.	52
Bridgetown, Barbados	11	6	51	1	n. 84 e.	50
Cienfuegos, Cuba	41	3	37	2	n. 43 e.	52
Colon, Panama, S. A. †	10	15	9	4	s. 45 e.	7
Curaçoa, W. I	1	8	56	0	s. 83 e.	56
Grand Turk, W. I. †	1	6	26	0	s. 79 e.	26
Hamilton, Bermuda	14	24	16	16	s.	10
Havana, Cuba †	1	6	26	1	s. 79 e.	26
Kingston, Jamaica †	18	1	6	10	n. 13 w.	18
Port of Spain, Trinidad †	1	11	24	1	s. 67 e.	25
Puerto Principe, Cuba	22	9	43	3	n. 72 e.	42
Roseau, Dominica, W. I. †	6	7	20	2	s. 87 e.	18
San Juan, Porto Rico	2	23	39	5	s. 59 e.	40
Santiago de Cuba, Cuba	45	3	15	11	n. 5 e.	42
Santo Domingo, Santo Domingo	53	3	6	2	n. 6 e.	50
Honolulu, H. I	25	6	44	3	n. 65 e.	45

* From observations at 8 p. m. only. † From observations at 8 a. m. only.

TABLE IV.—*Thunderstorms and auroras, September, 1904.*

States.	No. of stations.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total.		
																																		No.	Days.	
Alabama	60	T.	1	2	6	6	4	1	2	1			3	5							1	3	3	3			2							43	15	T.
		A.																																0	0	A.
Arizona	56	T.		1	8	2	1				4	1	3	12	3	9	5	4	2					1			1							57	15	T.
		A.																																0	0	A.
Arkansas	57	T.		11	3					2			1		7	1			2	7	10	5	7	5	1	4	7							73	15	T.
		A.																																0	0	A.
California	167	T.		2	3	2	1	1	1	2	3	1	3	5	3	4	6	8	4	6	2	4	13	4	23	30	20	5				1		157	26	T.
		A.																																0	0	A.
Colorado	70	T.	14	5	1		1	2	1		2	4	3	2		1	2	5	5	2	3	6	5	8	3	1	1	2	10	5	2	1		97	27	T.
		A.																																0	0	A.
Connecticut	21	T.			2	7				14	1		1	12	3	7	4														8			59	10	T.
		A.																																0	0	A.
Delaware	5	T.		1	1											3								1						1				7	5	T.
		A.																																0	0	A.
Dist. of Columbia	4	T.												1		1						1							1					4	4	T.
		A.																																0	0	A.
Florida	61	T.	5	8	10	11	11	14	12	8	6	4	7	6	3	4	10	12	3	7	6	8	9	6	3	2			1	1	1			178	27	T.
		A.																																0	0	A.
Georgia	67	T.		1	6	13	6	5	1		1					2							5	6	1				4					51	12	T.
		A.	1														1																	2	2	A.
Idaho	34	T.																		1	1	2	2	4	1		4	3						18	8	T.
		A.																																0	0	A.
Illinois	84	T.	16	10	1			3	6	1			13	40	2	5			5	44	8	16			2	23	15	27	26	8	2			273	21	T.
		A.																							1					1				2	2	A.
Indiana	58	T.	6	14	4			1	9	2	1		13	8	11	7				28	1	7				10	7	18	3	12				162	19	T.
		A.																																0	0	A.
Indian Territory	20	T.	1										2	1	2						1	2		1	2	2								14	9	T.
		A.																																0	0	A.
Iowa	128	T.	41	25		1	2	9	2			5	13		23	1			10	13	17	15	2	1	3	20	9	5	25	20	11	1		274	24	T.
		A.	1																															1	1	A.
Kansas	88	T.	4	5	3							4	4	2	5	1					6	3	2	2	4	2	2	4	4	5	2	1		65	20	T.
		A.																																0	0	A.
Kentucky	41	T.	4		3				3	2				1	1	2			1	9	2	2				1		5	3		1			40	15	T.
		A.																																0	0	A.
Louisiana	46	T.	9	15	3	6	5	10	8	1										4	2	4	4	11	8	1	4							95	16	T.
		A.																																0	0	A.
Maine	25	T.			6	4	1							2		1	2			8	1	7									1	11		44	11	T.
		A.						3	1																									4	2	A.
Maryland	42	T.			9					1	6			12		12	1					6	1						4					52	9	T.
		A.																																0	0	A.
Massachusetts	48	T.		1	1	3				17		1	1	16		5	7									1					14	2		69	12	T.
		A.																																0	0	A.
Michigan	106	T.	11	8	1			1	17	1	1		19		1	1			5	22	1	8		1	2	20	11	12		12	7	1		163	22	T.
		A.					1																											1	1	A.
Minnesota	67	T.	18	4		1	17	5						4	3				2	3				6	9	4	10	4	4	18	1			113	17	T.
		A.																																0	0	A.
Mississippi	57	T.	4	4	3	4		1	2			1		4	1	1				1	2	1	4	8	3		4							48	17	T.
		A.																		1														1	1	A.
Missouri	86	T.	6	29	1				3	1			10	1	43	5			2	22	31	18	4		3	21	5	10	6		3	3		227	21	T.
		A.																																0	0	A.
Montana	54	T.	1																			1	1	6	2			1						12	6	T.
		A.														1																		1	1	A.
Nebraska	137	T.	15	2								11	6	12	21						1				9	4		4	25	24	1	2		137	14	T.
		A.																																0	0	A.
Nevada	40	T.						1						1	2	3	4	2	5	5	1	3	2	2			2	1						34	14	T.
		A.																																0	0	A.
New Hampshire	21	T.			8	2								1		6	5			2	1	3									2			30	9	T.
		A.																																0	0	A.
New Jersey	48	T.		3	11					2				7	6	17	7											4	1		3	2		63	11	T.
		A.																																0	0	A.
New Mexico	31	T.	1	1	1		1								1			1			1	1			1	1		1	1					12	12	T.
		A.																																0	0	A.
New York	129	T.		11	5	6				5	2			2	1	12	5			6		4	1			4		10			4	3		81	16	T.
		A.																																0	0	A.
North Carolina	56	T.	7	6	2	14	6	1		2	1				6	3	1					6	2	1					4	1				63	16	T.
		A.																																0	0	A.
North Dakota	48	T.	3			2	3							2										1	2	3		1	3	5	1			26	11	T.
		A.					1	1						1																				3	3	A.
Ohio	101	T.	5	31	12				13	15	3		5	4	1	9				14	18	1	1	1		5	3	22	1		8			172	20	T.
		A.																																0	0	A.
Oklahoma	36	T.										1	8		1						7	6			1	5	1			2				32	9	T.
		A.																																0	0	A.
Oregon	70	T.																					7	8	3	7	4				1			30	6	T.
		A.																																0	0	A.
Pennsylvania	91	T.	3	5	20	5				18	9	1		9	3	6	1					1				1	1	1			6	1		91	17	T.
		A.																																0	0	A.
Rhode Island	6	T.				2				2	1				1	1															3	1		11	7	T.
		A.																																0	0	A.
South Carolina	54	T.			1	9	11	3	2	1					1						2	9	5					1	1					46	12	T.
		A.																																0	0	A.
South Dakota	56	T.	6	1										5	3	1					1			2	4	1	2		4	11				41	12	T.
		A.																																0	0	A.
Tennessee	56	T.	5	3	11	2			1	5			1	2	2						6	5		1			1		9			1		55	15	T.
		A.																																0	0	A.
Texas	126	T.	4	9	13	12	7	8	5	3			5	2	5	7		1	1	2	5	8	12	11	7	4		1	2	3				137	24	T.
		A.																																0	0	A.
Utah	64	T.								1	3	1	2	5	1	3	10	7	3	2	1	3	1	8			4	3	5		1	1		65	20	T.
		A.																																0	0	A.
Vermont	12	T.		1	8	3					1					1			1	5	2	6										6		34	10	T.
		A.															2																	2	1	A.
Virginia	40	T.	3	6	1	4				5	5	1		1	1	7						5	1						8	1	1			50	15	T.
		A.																																0	0	A.
Washington	71	T.																					1	3	1	1								6	4	T.
		A.																																0	0	A.
West Virginia	47	T.	7	2	6	1				9	10	1	1	2	3	1					1	1		2	2			1	6					56	17	T.
		A.																																0	0	A.
Wisconsin	63	T.	22	18	1	1	3	22	4				6	1	8		1	1	13	19	4				4	13	20	5		28	15			209	21	T.
		A.																																0	0	A.
Wyoming	38	T.	5	1								2							1		1	3		4				2	4	1				24	10	T.
		A.																																0	0	A.
Sums	2993	T.	227	246	175	123	80	88	92	121	60	39	130	190	178	150	71	41	65	232	148	184	95	118	104	191	140	153	165	158	98	38		3,900		T.
		A.	2				2	4	1					1			1	1	2	1					1					1				17		A.

TABLE V.—*Accumulated amounts of precipitation for each 5 minutes, for storms in which the rate of fall equaled or exceeded 0.25 in any 5 minutes, or 0.75 in 1 hour during September, 1904, at all stations furnished with self-registering gages.*

Stations.	Date.	Total duration.		Total amount of precipitation.	Excessive rate.		Amount before excessive began.	Depths of precipitation (in inches) during periods of time indicated.													
		From—	To—		Began—	Ended—		5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Albany, N. Y.	3			0.58														0.48			
Alpena, Mich.	2			0.48														0.31			
Amarillo, Tex.	28			1.68														0.74			
Asheville, N. C.	4	12:37 p. m.	5:00 p. m.	1.35	12:53 p. m.	1:25 p. m.	0.08	0.16	0.29	0.39	0.66	0.94	1.14	1.19							
Atlanta, Ga.	4			0.22														0.22			
Atlantic City, N. J.	20			0.43												0.43					
Augusta, Ga.	5	3:48 p. m.	4:28 p. m.	0.98	3:48 p. m.	4:15 p. m.	0.00	0.30	0.64	0.74	0.86	0.93	0.96								
Baltimore, Md.	14–15	7:30 p. m.	2:30 a. m.	3.43	8:24 p. m.	9:10 p. m.	0.26	0.14	0.31	0.54	0.81	1.01	1.14	1.28	1.48	1.53					
Binghamton, N. Y.	24			1.13														0.62			
Birmingham, Ala.	12			0.42									0.41								
Bismarck, N. Dak.	1–2			0.87														0.39			
Block Island, R. I.	14			0.40														0.32			
Boise, Idaho	22			0.17														0.13			
Boston, Mass.	14–15	9:40 p. m.	9:30 a. m.	3.48	6:05 a. m.	7:50 a. m.	1.53	0.07	0.08	0.17	0.23	0.30	0.41	0.44	0.49	0.59	0.74	0.92	1.30	1.59	1.73
Buffalo, N. Y.	26			0.41														0.24			
Cairo, Ill.	14	12:40 a. m.	9:00 a. m.	0.91	2:15 a. m.	2:45 a. m.	0.26	0.15	0.23	0.34	0.39	0.46	0.52								
Cape Henry, Va.	5			0.85														0.32			
Charleston, S. C.	7			0.80														0.52			
Charlotte, N. C.	4			0.76														0.72			
Chattanooga, Tenn.	3–4			0.48														0.41			
Chicago, Ill.	18	2:15 a. m.	5:45 a. m.	1.25	2:29 a. m.	3:00 a. m.	0.01	0.25	0.38	0.40	0.46	0.54	0.57	0.61							
Cincinnati, Ohio	18			0.57														0.29			
Cleveland, Ohio	2–3			0.55					0.30												
Columbia, Mo.	18–19	6:23 p. m.	7:45 a. m.	4.38	12:08 a. m.	12:58 a. m.	0.34	0.05	0.13	0.25	0.55	0.69	0.85	1.08	1.30	1.33	1.41				
					12:58 a. m.	2:03 a. m.	......	1.47	1.62	1.78	2.15	2.42	2.58	2.68	2.78	2.88	2.93	3.03			
Columbia, S. C.	5–6			1.48														0.62			
Columbus, Ohio	24			0.34														0.28			
Concord, N. H.	14–15	12:40 p. m.	9:32 a. m.	2.82	10:43 p. m.	11:43 p. m.	0.62	0.31	0.46	0.62	0.79	0.84	0.87	0.90	0.96	0.99	1.04	1.15			
Corpus Christi, Tex.	14–15	11:50 p. m.	7:12 a. m.	1.89	5:01 a. m.	5:41 a. m.	0.42	0.21	0.52	0.73	0.99	1.12	1.23	1.28	1.33						
Davenport, Iowa	13	8:35 a. m.	1:05 p. m.	1.11	9:55 a. m.	10:15 a. m.	0.07	0.19	0.58	0.77	0.84										
Do	25	9:17 p. m.	11:15 p. m.	2.07	9:36 p. m.	9:51 p. m.	T.	0.37	0.54	0.62											
					10:36 p. m.	11:07 p. m.	0.89	0.32	0.68	0.94	0.96	1.01	1.10								
Denver, Colo.	1			0.51									0.50								
Des Moines, Iowa	1			0.64						0.55											
Detroit, Mich.	1	4:17 p. m.	4:40 p. m.	0.65	4:20 p. m.	4:30 p. m.	T.	0.43	0.64												
Dodge, Kans.	29			1.17														*			
Dubuque, Iowa	25	7:10 p. m.	8:10 p. m.	1.16	7:23 p. m.	8:00 p. m.	0.01	0.31	0.48	0.57	0.75	0.95	1.03	1.08	1.13	1.15					
Duluth, Minn.	1–2			1.93														0.34			
Eastport, Me.	15	8:30 a. m.	12:35 p. m.	1.62	10:40 a. m.	11:55 a. m.	0.51	0.05	0.11	0.15	0.22	0.34	0.43	0.50	0.56	0.62	0.67	0.78	1.00		
Elkins, W. Va.	27			0.42									0.42								
Erie, Pa.	24			1.25														0.52			
Escanaba, Mich.	1–2			2.37														0.72			
Evansville, Ind.	2–3	7:25 p. m.	D. N.	1.55	7:42 p. m.	8:22 p. m.	T.	0.15	0.24	0.38	0.60	0.89	1.13	1.36	1.48						
Do	26	6:00 a. m.	7:40 a. m.	0.76	6:02 a. m.	6:47 a. m.	T.	0.22	0.44	0.54	0.66	0.71									
Do	26–27	6:45 p. m.	11:50 a. m.	1.23	10:53 p. m.	11:08 p. m.	0.19	0.08	0.39	0.63	0.65										
Fort Smith, Ark.	20			1.31														0.58			
Fort Worth, Tex.	5			1.28											0.53						
Galveston, Tex.	7	12:40 a. m.	D. N.	0.86	1:07 a. m.	1:52 a. m.	T.	0.08	0.17	0.26	0.34	0.40	0.50	0.61	0.71	0.77					
Do	14	7:20 a. m.	5:00 p. m.	2.29	8:01 a. m.	8:46 a. m.	T.	0.05	0.09	0.21	0.41	0.61	0.91	0.98	1.03	1.11					
Grand Junction, Colo.	29–30			0.25														0.06			
Grand Rapids, Mich.	1–2	10:25 p. m.	2:00 a. m.	1.38	10:27 p. m.	11:45 p. m.	T.	0.16	0.21	0.27	0.47	0.60	0.71	0.87	0.92	0.94	0.95	1.11	1.33		
Do	25	9:15 p. m.	11:45 p. m.	0.95	10:05 p. m.	10:30 p. m.	0.09	0.09	0.31	0.47	0.66	0.71									
Green Bay, Wis.	24	12:30 a. m.	6:12 a. m.	1.13	1:51 a. m.	2:16 a. m.	0.17	0.34	0.62	0.67	0.70	0.76									
Hannibal, Mo.	18–19	8:10 p. m.	5:45 a. m.	1.56	8:23 p. m.	8:53 p. m.	0.01	0.06	0.15	0.35	0.52	0.64	0.71								
Harrisburg, Pa.	9			0.42									0.33								
Hatteras, N. C.	5	3:45 p. m.	8:10 p. m.	1.37	4:48 p. m.	5:18 p. m.	0.04	0.10	0.20	0.44	0.77	1.00	1.09								
Huron, S. Dak.	1			0.18														0.09			
Indianapolis, Ind.	18	7:02 a. m.	12:10 p. m.	0.95	7:27 a. m.	7:55 a. m.	0.01	0.22	0.29	0.39	0.45	0.59	0.62								
Jacksonville, Fla.	18	10:50 a. m.	1:20 p. m.	1.42	11:45 a. m.	12:05 p. m.	0.10	0.28	0.69	1.04	1.23										
Do	21	1:26 p. m.	3:40 p. m.	1.14	2:28 p. m.	3:00 p. m.	0.01	0.10	0.40	0.67	0.89	0.99	1.06	1.10							
		6:55 p. m.	9:05 p. m.	0.98	7:01 p. m.	7:24 p. m.	0.01	0.15	0.31	0.50	0.68	0.76									
Jupiter, Fla.	8	4:45 p. m.	6:30 p. m.	0.93	5:32 p. m.	6:13 p. m.	0.11	0.10	0.20	0.35	0.49	0.56	0.65	0.76	0.79						
Kalispell, Mont.	22			0.40														0.26			
Kansas City, Mo.	13			0.63														0.35			
Key West, Fla.	18			0.53										0.28							
Knoxville, Tenn.	34			0.67														0.33			
La Crosse, Wis.	25			0.83														0.70			
Lewiston, Idaho	26			0.50														0.13			
Lexington, Ky.	19			0.45										0.44							
Lincoln, Nebr.	13	2:20 a. m.	7:00 a. m.	1.20	2:28 a. m.	2:48 a. m.	0.02	0.28	0.50	0.73	0.84	0.88									
Little Rock, Ark.	25			0.36														0.19			
Los Angeles, Cal.	25			0.22														0.17			
Louisville, Ky.	3			0.65									0.49								
Lynchburg, Va.	27			0.42							0.42										
Macon, Ga.	21	9:40 p. m.	10:30 p. m.	1.15	10:00 p. m.	10:16 p. m.	0.04	0.43	0.83	1.05	1.09										
Memphis, Tenn.	20			0.45														0.23			
Meridian, Miss.	20	5:47 p. m.	7:00 p. m.	0.83	6:05 p. m.	6:40 p. m.	0.05	0.05	0.20	0.37	0.51	0.58	0.70	0.75							
Do	22–23	5:43 p. m.	D. N.	4.19	8:10 p. m.	8:55 p. m.	0.42	0.05	0.18	0.55	0.72	1.14	1.50	1.79	2.08	2.15					
					11:30 p. m.	12:05 a. m.	3.02	0.07	0.17	0.30	0.45	0.71	0.85	0.92							
Milwaukee, Wis.	25			0.45														0.32			
Minneapolis, Minn.	5			1.31														0.73			
Modena, Utah	12	4:50 p. m.	7:35 p. m.	1.78	5:34 p. m.	6:45 p. m.	0.04	0.14	0.15	0.24	0.35	0.42	0.58	0.74	0.96	1.14	1.27	1.41	1.68		
Montgomery, Ala.	4			0.45														0.25			
Nantucket, Mass.	11–12			0.40														0.15			
Nashville, Tenn.	3			0.34														0.24			
New Haven, Conn.	14–15	9:10 p. m.	7:50 a. m.	3.49	4:16 a. m.	6:00 a. m.	1.11	0.06	0.19	0.32	0.44	0.60	0.71	0.89	0.96	1.05	1.18	1.30	1.56	1.99	
New Orleans, La.	6	11:55 a. m.	1:15 p. m.	0.61	12:10 p. m.	12:30 p. m.	0.01	0.21	0.30	0.43	0.53	0.57									
New York, N. Y.	14–15	7:45 p. m.	6:25 a. m.	2.75	8:02 p. m.	8:34 p. m.	0.02	0.18	0.37	0.46	0.51	0.58	0.67								
Norfolk, Va.	27	7:03 p. m.	8:05 p. m.	0.84	7:31 p. m.	7:50 p. m.	0.05	0.20	0.54	0.71	0.78										
Northfield, Vt.	20			0.65														0.43			
North Head, Wash.	8			0.08														0.07			
Oklahoma, Okla.	20	12:25 a. m.	3:30 a. m.	1.17	1:35 a. m.	1:55 a. m.	0.42	0.06	0.29	0.48	0.59	0.60	0.64	0.69							
Omaha, Nebr.	23	8:44 p. m.	9:20 p. m.	0.65	8:45 p. m.	9:00 p. m.	T.	0.28	0.57	0.62											
Palestine, Tex.	5	3:15 p. m.	7:00 p. m.	1.38	4:27 p. m.	5:07 p. m.	0.02	0.13	0.45	0.65	0.80	0.95	1.06	1.14	1.19						
Do	21	9:30 p. m.	11:45 p. m.	0.67	9:45 p. m.	10:05 p. m.	0.01	0.15	0.27	0.37	0.44										
Parkersburg, W. Va.	3			0.36									0.25								
Pensacola, Fla.	7			0.19									0.18								
Philadelphia, Pa.	14–15	1:10 p. m.	D. N.	5.48	5:15 p. m.	6:17 p. m.	0.30	0.24	0.40	0.60	0.81	0.99	1.23	1.55	2.05	2.08	2.10	2.26	2.37		
					1:26 a. m.	2:16 a. m.	2.97	0.06	0.18	0.21	0.25	0.55	0.74	0.87	0.96	1.00	1.15				
					2:16 a. m.	3:55 a. m.	......	1.22	1.32	1.37	1.43	1.50	1.57	1.66	1.68	1.73	1.84	2.02	2.27	2.50	
Pittsburg, Pa.	14	2:00 p. m.	2:50 p. m.	0.57	2:05 p. m.	2:23 p. m.	0.01	0.14	0.22	0.40	0.50										

TABLE V.—*Accumulated amounts of precipitation for each 5 minutes, etc.*—Continued.

Stations.	Date.	Total duration. From—	Total duration. To—	Total amount of precipitation.	Excessive rate. Began—	Excessive rate. Ended—	Amount before excessive began.	5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Pocatello, Idaho	26			0.31														0.14			
Portland, Me	14-15	1:40 p.m.	10:30 a.m.	2.39	12:45 a.m.	1:10 a.m.	0.13	0.08	0.12	0.23	0.58	1.64									
Portland, Oreg	28			0.06														0.04			
Pueblo, Colo	29-30			1.10														0.09			
Raleigh, N. C	14			2.54														0.60			
Richmond, Va	14			2.83														*			
Rochester, N. Y	2	10:12 p.m.	D. N.	0.60	10:17 p.m.	10:36 p.m.	T.	0.19	0.33	0.38	0.40										
Sacramento, Cal	24	7:55 p.m.	9:00 p.m.	0.71	8:35 p.m.	9:00 p.m.	0.02	0.20	0.33	0.51	0.62	0.67									
St. Louis, Mo	24			0.50														0.40			
St. Paul, Minn	5	4:35 p.m.	11:52 p.m.	2.20	8:07 p.m.	8:50 p.m.	0.50	0.13	0.29	0.45	0.86	1.10	1.13	1.17	1.23						
Salt Lake City, Utah	18			0.09				0.07													
San Antonio, Tex	13	9:10 a.m.	10:37 a.m.	1.88	9:28 a.m.	10:23 a.m.	0.14	0.10	0.24	0.42	0.53	0.73	0.94	1.05	1.32	1.58	1.67				
Do	14	5:00 a.m.	2:40 p.m.	3.39	9:00 a.m.	9:50 a.m.	1.63	0.08	0.19	0.24	0.31	0.41	0.53	0.66	0.79	0.88	0.96				
San Diego, Cal	25			T.																	
Sandusky, Ohio	2	5:25 p.m.	5:40 p.m.	0.38	5:27 p.m.	5:37 p.m.	T.	0.19	0.37												
San Francisco, Cal	23	12:10 a.m.	10:40 a.m.	2.85	3:15 a.m.	3:50 a.m.	0.32	0.13	0.24	0.30	0.41	0.57	0.73	0.78	0.81						
Savannah, Ga	6	1:16 p.m.	8:30 p.m.	1.29	1:20 p.m.	2:00 p.m.	0.01	0.12	0.30	0.45	0.60	0.76	0.80	0.83	0.88						
Scranton, Pa	8	3:41 p.m.	6:50 p.m.	1.09	3:41 p.m.	4:20 p.m.	0.00	0.06	0.18	0.34	0.40	0.45	0.53	0.73	0.80						
Seattle, Wash	21-22			0.10														0.06			
Shreveport, La	2-3	11:40 p.m.	2:15 a.m.	1.64	12:20 a.m.	1:35 a.m.	0.39	0.17	0.27	0.37	0.49	0.54	0.57	0.64	0.71	0.77	0.82	0.91	1.24		
Spokane, Wash	22			0.09														0.09			
Springfield, Ill	18-19	7:18 p.m.	3:00 a.m.	1.32	7:18 p.m.	7:40 p.m.	0.00	0.09	0.35	0.46	0.53	0.55									
Springfield, Mo	19			0.65														0.51			
Syracuse, N. Y	29			0.42														0.28			
Tampa, Fla	2			0.34									0.34								
Taylor, Tex	4-5	10:12 p.m.	3:13 a.m.	1.74	10:20 p.m.	11:10 p.m.	0.02	0.11	0.24	0.30	0.42	0.71	1.00	1.25	1.39	1.50	1.59				
Toledo, Ohio	26			0.68														0.65			
Topeka, Kans	30	D. N.	6:40 a.m.	1.78	4:21 a.m.	5:38 a.m.	0.04	0.09	0.24	0.38	0.60	0.69	0.82	0.87	0.90	0.92	0.96	1.28	1.55		
Valentine, Nebr	1			0.54														0.28			
Vicksburg, Miss	1			0.17					0.17												
Washington, D. C	14-15	4:25 p.m.	1:30 a.m.	4.44	7:15 p.m.	7:50 p.m.	0.15	0.08	0.29	0.57	0.87	1.21	1.42	1.74							
					9:15 p.m.	11:00 p.m.	2.09	0.25	0.43	0.58	0.68	0.87	0.94	0.98	1.12	1.21	1.28	1.33	1.64	1.93	
Wichita, Kans	11			1.24														0.50			
Williston, N. Dak	27			0.10														0.09			
Wilmington, N. C	13-14			1.04														0.45			
Wytheville, Va	1			0.35														0.24			
Yankton, S. Dak	1			0.32														0.31			
Havana, Cuba	18			1.02							0.61										
San Juan, Porto Rico	18	10:30 a.m.	2:30 p.m.	1.23	12:09 p.m.	12:38 p.m.	0.35	0.18	0.20	0.42	0.55	0.67	0.76								
Honolulu, H. I	15	10:34 p.m.	11:50 p.m.	0.66	11:14 p.m.	11:30 p.m.	0.01	0.05	0.46	0.60	0.65										

*Self-register not working

TABLE VI.—*Data furnished by the Canadian Meteorological Service, September, 1904.*

Stations.	Pressure, in inches. Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hours.	Departure from normal.	Temperature. Mean.	Departure from normal.	Mean maximum.	Mean minimum.	Precipitation. Total.	Departure from normal.	Depth of snow.
	Ins.	Ins.	Ins.	°	°	°	°	Ins.	Ins.	Ins.
St. Johns, N. F	29.83	29.97	.00	51.6	−2.4	59.6	43.7	4.43	+0.72	
Sydney, C. B. I	30.03	30.07	+.06	54.7	−1.8	64.0	45.3	3.93	+0.65	
Halifax, N. S	29.98	30.09	+.05	55.0	−2.6	64.7	45.3	4.52	+0.81	
Grand Manan, N. B	30.00	30.05	+.02	55.0	−1.1	62.0	47.9	5.12	+1.95	
Yarmouth, N. S	30.02	30.09	+.04	54.0	−2.1	61.7	46.3	3.02	−0.43	
Charlottetown, P. E. I	30.00	30.04	+.03	54.7	−2.6	63.3	46.1	4.26	+0.86	
Chatham, N. B	29.97	29.99	−.01	54.8	−0.6	66.2	43.3	5.34	+2.63	
Father Point, Que	29.95	29.97	−.01	47.4	−3.0	54.6	40.3	3.06	−0.07	
Quebec, Que	29.70	30.02	+.01	50.9	−4.2	58.6	43.2	5.84	+2.17	T.
Montreal, Que	29.83	30.04	.00	54.5	−3.9	61.5	47.5	6.65	+3.35	T.
Rockliffe	29.42	29.96	−.07	52.4	−3.3	63.0	41.9	5.90	+2.62	
Ottawa, Ont	29.70	30.02	−.02	54.8	−2.6	63.0	46.6	5.09	+2.40	
Kingston, Ont	29.74	30.05	+.01	57.6	−2.4	65.1	50.0	4.26	+1.46	
Toronto, Ont	29.68	30.05	−.01	58.7	−0.3	67.2	50.2	3.99	+0.74	
White River, Ont	28.69	30.01	+.03	47.6	−2.7	56.5	38.6	3.77	+1.00	T.
Port Stanley, Ont	29.44	30.08	+.02	59.3	−0.2	67.6	51.1	3.05	+0.32	
Saugeen, Ont	29.34	30.04	−.01	58.0	+0.5	66.8	49.2	2.46	−0.48	

Stations.	Pressure, in inches. Actual, reduced to mean of 24 hours.	Sea level, reduced to mean of 24 hours.	Departure from normal.	Temperature. Mean.	Departure from normal.	Mean maximum.	Mean minimum.	Precipitation. Total.	Departure from normal.	Depth of snow.
	Ins.	Ins.	Ins.	°	°	°	°	Ins.	Ins.	Ins.
Parry Sound, Ont	29.30	30.04	+.01	55.6	−0.4	64.9	46.4	4.84	+1.17	
Port Arthur, Ont	29.30	30.01	+.03	50.2	−2.0	57.9	42.5	3.41	−0.07	
Winnipeg, Man	29.16	30.00	+.06	51.5	−1.0	62.1	40.8	1.88	−0.15	
Minnedosa, Man	28.21	30.03	+.09	51.2	+0.7	61.7	40.8	0.70	−0.66	
Qu'Appelle, Assin	27.75	30.00	+.08	50.5	−0.6	60.8	40.2	2.11	+0.78	2.9
Medicine Hat, Assin	27.71	29.98	+.06	57.7	+2.7	72.1	43.4	0.68	−0.50	
Swift Current, Assin	27.45	30.01	+.09	53.0	−0.1	65.1	41.0	1.44	+0.22	
Calgary, Alberta	26.48	30.01	+.09	51.0	+1.2	64.8	37.1	0.69	−0.67	
Banff, Alberta	25.44	30.01	+.08	49.4	+3.6	62.6	36.3	0.74	−0.93	0.3
Edmonton, Alberta	27.69	29.98	+.08	50.8	+1.5	61.8	39.8	2.06	+0.73	0.6
Prince Albert, Sask	28.41	29.97	+.07	48.1	−0.3	58.7	37.4	0.57	−0.71	
Battleford, Sask	28.28	30.02	+.12	50.8	−1.0	63.0	38.6	1.16	−0.09	
Kamloops, B. C	28.76	29.98	+.01	59.8	+2.4	72.8	46.7	0.12	−0.73	
Victoria, B. C	29.96	30.06	+.05	57.4	+2.6	65.6	49.1	0.32	−1.84	
Barkerville, B. C	25.74	30.05	+.07	48.6	+1.9	60.1	37.1	3.06	+0.15	1.0
Hamilton, Bermuda	29.97	30.13	+.06	78.8	+1.4	84.7	73.0	1.60	−4.91	
Dawson, Yukon	......	......	......	37.0	......	46.5	27.6	1.01	......	3.0

TABLE VII.—*Heights of rivers referred to zeros of gages, September, 1904.*

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
	Miles.	Feet.	Feet.		Feet.		Feet.	Feet.
Milk River.								
Havre, Mont	237	9	2.7	3-5	2.2	22-30	2.4	0.5
Yellowstone River.								
Glendive, Mont	78	17	3.9	3	1.4	30	2.2	2.5
James River.								
Lamoure, N. Dak	330	14	0.3	1-7	−0.3	27-30	0.1	0.6
Huron, S. Dak	139	9	0.5	26-30	0.2	13	0.4	0.3
Republican River.								
Clay Center, Kans	42	18	6.5	1, 2	5.7	25	6.1	0.8
Kansas River.								
Manhattan, Kans	160	18	3.9	1	2.8	10, 23-27	3.1	1.1
Topeka, Kans	87	21	7.1	1, 2	6.0	28, 29	6.5	1.1

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water. Height.	Highest water. Date.	Lowest water. Height.	Lowest water. Date.	Mean stage.	Monthly range.
	Miles.	Feet.	Feet.		Feet.		Feet.	Feet.
Missouri River.								
Townsend, Mont	2,504	11	3.8	1-3, 29, 30	3.6	10-21	3.7	0.2
Fort Benton, Mont	2,285	12	0.5	1-5	0.1	9-12	0.3	0.4
Bismarck, N. Dak	1,309	14	1.7	10	−0.1	30	0.7	1.8
Pierre, S. Dak	1,114	14	4.6	4	2.3	28-30	3.1	2.3
Sioux City, Iowa	784	19	7.4	10	5.2	29, 30	5.9	2.2
Blair, Nebr	705	15	6.9	11	4.8	28, 30	5.6	2.1
Omaha, Nebr	669	10	7.3	12	5.7	26-30	6.3	1.6
St. Joseph, Mo	481	10	3.2	14	0.8	23-25	1.7	2.4
Kansas City, Mo	388	21	9.5	1	6.5	25	7.8	3.0
Glasgow, Mo	231	19	6.4	17	3.4	25	4.5	3.0
Boonville, Mo	199	20	9.7	19, 20	7.1	27, 28	7.9	2.6
Hermann, Mo	103	24	10.5	20	6.9	27	8.0	3.6

TABLE VII.—*Heights of rivers referred to zeros of gages*—Continued.

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
	Miles.	Feet.	Feet.		Feet.		Feet.	Feet.
Minnesota River.								
Mankato, Minn	127	18	2.5	3	1.9	25-31	2.2	0.6
Chippewa River.								
Chippewa Falls, Wis	75	16	5.8	29	1.0	18, 19, 23	2.9	4.8
Red Cedar River.								
Cedar Rapids, Iowa	77	14	3.2	5	2.8	21-30	2.9	0.4
Iowa River.								
Iowa City, Iowa	57	......	− 0.2	7	− 1.4	28	−0.9	1.2
Illinois River.								
Peoria, Ill	135	14	9.6	30	7.1	16, 17	7.8	2.5
Red Bank Creek.								
Brookville, Pa	35	8	0.4	1-14	− 0.4	24-30	0.2	0.8
Clarion River.								
Clarion, Pa	32	10	1.7	27	− 0.3	23, 24	0.4	2.0
Conemaugh River.								
Johnstown, Pa	64	7	0.7	15, 16	0.3	8	0.5	0.4
Allegheny River.								
Warren, Pa	177	14	1.8	27, 28	− 1.1	23, 24	0.0	2.9
Oil City, Pa	123	13	2.1	27	0.0	25	0.8	2.1
Parker, Pa	73	20	2.2	28	− 0.1	23	0.6	2.3
Freeport, Pa	29	20	3.2	29	0.9	23, 24	1.6	2.3
Cheat River.								
Rowlesburg, W. Va	36	14	1.1	1	0.3	13	0.7	0.8
Youghiogheny River.								
Confluence, Pa	59	10	− 0.3	1-7	− 0.7	22-30	−0.5	0.4
West Newton, Pa	15	23	0.2	1, 2	0.0	8-30	0.0	0.2
Monongahela River.								
Weston, W. Va	161	18	− 1.9	1-9	− 2.2	20-30	−2.0	0.3
Fairmont, W. Va	119	25	13.9	2	12.7	21	13.5	1.2
Greensboro, Pa	81	18	6.2	1, 2, 5-11	5.8	28-30	6.0	0.4
Lock No. 4, Pa	40	28	7.0	2	5.8	20-24	7.0	1.2
Beaver River.								
Ellwood Junction, Pa	10	14	2.3	2	1.0	29, 30	1.8	1.3
Muskingum River.								
Zanesville, Ohio	70	20	7.7	2, 5, 6	7.4	17-26	7.5	0.3
Little Kanawha River.								
Glenville, W. Va	77	20	0.0	1, 7	− 1.2	25	−0.6	1.2
Creston, W. Va	38	20	− 0.1	1	− 0.8	11-30	−0.7	0.7
Great Kanawha, River.								
Charleston, W. Va	58	30	7.0	6, 7	6.4	28-30	6.6	0.6
New River.								
Radford, Va	155	14	0.5	3-5	− 1.4	30	−0.2	1.9
Hinton, W. Va	95	14	1.7	5	0.9	27-29	1.2	0.8
Scioto River.								
Columbus, Ohio	110	17	2.3	1	1.4	24, 25	1.8	0.9
Licking River.								
Falmouth, Ky	30	25	1.4	1	0.2	24-30	0.5	1.2
Miami River.								
Dayton, Ohio	77	18	0.8	27, 28	0.4	17	0.6	0.4
Kentucky River.								
Beattyville, Ky	254	30	0.3	1-8	0.2	9-30	0.2	0.1
High Bridge, Ky	117	17	9.2	1-4	8.6	28, 29	8.9	0.6
Frankfort, Ky	65	31	5.7	12-15	4.7	30	5.4	1.0
Wabash River.								
Mount Carmel, Ill	50	15	4.0	30	0.7	11-21	1.4	3.3
Cumberland River.								
Burnside, Ky	518	50	0.4	1, 20	0.0	10-12, 21, 22	0.2	0.4
Celina, Tenn	383	45	1.2	1	0.3	27	0.7	0.9
Carthage, Tenn	308	40	1.2	1	0.1	19, 21, 25, 26	0.5	1.1
Nashville, Tenn	193	40	3.2	4	0.1	25, 26, 30	1.5	2.2
Clarksville, Tenn	126	42	3.5	6	0.4	19, 20	1.6	3.1
Powell River.								
Tazewell, Tenn	30	20	0.7	5	0.1	22-27, 29, 30	0.3	0.6
Clinch River.								
Speers Ferry, Va	156	20	− 0.4	5	− 1.2	19	−0.9	0.8
Clinton, Tenn	52	25	4.2	7	2.5	20	3.0	1.7
Holston River.								
Bluff City, Tenn	170	15	0.7	5	0.0	26, 28	0.2	0.7
Rogersville, Tenn	103	14	1.9	5	1.2	19-30	1.4	0.7
French Broad River.								
Asheville, N. C	144	6	0.4	3	− 0.8	24	−0.6	1.2
Leadvale, Tenn	70	15	− 0.4	4, 5	− 1.9	23, 30	−1.3	1.5
Hiwassee River.								
Charleston, Tenn	18	22	0.7	1, 2, 6, 8, 9	0.1	28, 30	0.4	0.6
Tennessee River.								
Knoxville, Tenn	635	29	1.2	7	− 0.2	26, 27	0.3	1.4
Loudon, Tenn	590	25	1.5	6	0.2	29, 30	0.5	1.7
Kingston, Tenn	556	25	1.7	6	0.4	29, 30	0.9	1.3
Chattanooga, Tenn	452	33	2.4	8	0.6	27-30	1.3	1.8
Bridgeport, Ala	402	24	1.1	1, 9	0.0	26-30	0.4	1.1
Florence, Ala	255	16	0.6	1	− 0.2	26-30	0.2	0.8
Riverton, Ala	225	25	0.2	1	− 2.1	30	−1.1	2.3
Johnsonville, Tenn	95	21	1.8	1, 2	0.0	27-30	0.7	1.8
Ohio River.								
Pittsburg, Pa	966	22	6.9	29, 30	5.4	17	6.0	1.5
Davis Island Dam, Pa	960	25	3.6	30	1.9	23, 24, 26	2.4	1.7
Beaver Dam, Pa	925	27	4.5	30	1.8	18	2.7	2.7
Wheeling, W. Va	875	36	3.4	1	1.3	28, 29	2.2	2.1
Parkersburg, W. Va	785	36	4.3	1, 2	1.7	27-30	2.5	1.6
Point Pleasant, W. Va	703	39	2.7	1	0.8	28-30	1.6	1.9
Huntington, W. Va	660	50	5.8	1	3.0	28-30	4.0	2.8
Catlettsburg, Ky	651	50	3.9	1	1.1	29-30	2.0	2.8
Portsmouth, Ohio	612	50	5.3	1	2.1	30	3.3	3.2
Cincinnati, Ohio	499	50	6.8	2, 3	3.7	29, 30	5.0	3.1
Madison, Ind	413	46	6.2	4	2.9	25, 26, 29, 30	4.4	3.3
Louisville, Ky	367	28	4.0	3, 4	2.5	29, 30	3.1	1.5
Evansville, Ind	184	35	3.9	7, 8	2.2	26, 27	3.0	1.7
Paducah, Ky	47	40	3.2	1	1.9	18, 19, 22, 23-25, 27	2.3	1.3
Cairo, Ill	1	45	12.1	24	7.4	18, 19	9.6	4.7
St. Francis River.								
Marked Tree, Ark	104	17	2.0	26, 27	1.0	11, 12	1.6	1.0
Neosho River.								
Neosho Rapids, Kans	326	22	0.8	5, 15	− 0.4	1, 2	0.5	1.2
Iola, Kans	262	10	0.8	8	0.2	25	0.4	0.6
Neosho River—Cont'd.								
Oswego, Kans	184	20	1.5	23	0.5	25-29	0.7	1.0
Fort Gibson, Ind. T	3	22	11.8	24-25	10.0	15-17, 30	10.9	1.8
Canadian River.								
Calvin, Ind. T	99	10	1.7	11	0.0	9, 10	0.6	1.7
Black River.								
Blackrock, Ark	67	12	2.7	4	0.4	24	1.4	2.3
White River.								
Calicorock, Ark	272	15	2.2	4	− 0.2	15-25, 30	0.1	2.4
Batesville, Ark	217	18	3.9	5	2.4	26	2.7	1.5
Newport, Ark	185	26	2.5	6	0.9	25-27	1.4	1.6
Arkansas River.								
Wichita, Kans	832	10	0.3	1, 2	− 0.4	29, 30	−0.1	0.7
Tulsa, Ind. T	551	16	3.0	1, 2	2.2	30	2.5	0.8
Webbers Falls, Ind. T	465	23	6.8	26	3.9	21	4.7	2.9
Fort Smith, Ark	403	22	6.6	1, 28	4.1	19	5.0	2.5
Dardanelle, Ark	256	21	6.4	1	3.7	28	4.6	2.7
Little Rock, Ark	176	23	9.2	2	4.8	30	6.2	4.4
Yazoo River.								
Yazoo City, Miss	80	25	− 1.3	4	− 2.8	27-30	−2.2	1.5
Ouachita River.								
Camden, Ark	304	39	8.0	26	3.3	19-22	4.5	4.7
Monroe, La	122	40	6.0	3	0.4	18	2.0	5.6
Red River.								
Arthur City, Tex	688	27	6.7	1	5.1	18	5.9	1.6
Fulton, Ark	515	28	7.7	5	5.9	19	6.7	1.8
Shreveport, La	327	29	1.6	8-10	0.2	20-23	0.8	1.4
Alexandria, La	118	33	3.2	4	0.3	30	1.4	2.9
Mississippi River.								
St. Paul, Minn	1,954	14	5.2	8-11	2.8	2, 26, 27	3.8	2.4
Red Wing, Minn	1,914	14	4.3	9-12	2.2	1	3.2	2.1
Reeds Landing, Minn	1,884	12	4.3	10-12	2.3	25	3.2	2.0
La Crosse, Wis	1,819	12	5.1	11-14	3.1	1	4.1	2.0
Prairie du Chien, Wis	1,759	18	4.9	13-16	2.6	1	4.0	2.3
Dubuque, Iowa	1,699	18	5.2	15-18	3.1	1	4.4	2.1
Clinton, Iowa	1,629	16	5.0	19	2.7	1	4.1	2.3
Leclaire, Iowa	1,609	10	3.2	20	1.3	1, 2	2.5	1.9
Davenport, Iowa	1,593	15	4.9	20	2.6	1, 2	3.8	2.3
Muscatine, Iowa	1,562	16	5.8	21	3.4	1	4.6	2.4
Galland, Iowa	1,472	8	3.0	20	1.2	6	2.0	1.8
Keokuk, Iowa	1,463	15	5.4	29	1.8	2	3.3	3.6
Warsaw, Ill.[1]	1,458	18	8.6	29	6.1	16-18	7.2	2.5
Hannibal, Mo	1,402	13	7.8	29	2.9	3	4.6	4.9
Grafton, Ill	1,306	23	10.7	30	5.5	5-7	6.9	5.2
St. Louis, Mo	1,264	30	11.6	30	6.2	16	8.3	5.4
Chester, Ill	1,189	30	10.7	22	6.6	17, 18	8.2	4.1
New Madrid, Mo	1,003	34	9.7	1, 25	6.4	19	8.0	3.3
Luxora, Ark	905	33	4.9	1	1.8	20	3.3	3.1
Memphis, Tenn	843	33	7.7	1	3.8	21	5.3	3.9
Helena, Ark	767	42	11.9	1	6.7	21, 22	8.6	5.2
Arkansas City, Ark	635	42	15.4	1	7.6	21-24	10.2	7.8
Greenville, Miss	595	42	12.3	1, 2	6.2	23, 24	8.4	6.1
Vicksburg, Miss	474	45	12.4	3	5.6	24, 25	8.1	6.8
Natchez, Miss	373	46	14.5	4	8.2	24, 26	10.7	6.3
Baton Rouge, La	240	35	7.7	5, 6	4.2	22	5.6	3.5
Donaldsonville, La	188	28	5.4	3, 4	3.3	22	4.2	2.1
New Orleans, La	108	16	5.0	5, 6	4.0	22	4.5	1.0
Atchafalaya River.								
Melville, La	103	31	13.7	6	6.8	25	9.7	6.9
Mohawk River.								
Tribeshill, N. Y	42	15	0.2	27, 28	− 2.6	14	−1.5	2.8
Schenectady, N. Y	19	15	4.3	27	1.4	2	1.7	2.9
Hudson River.								
Glens Falls, N. Y	197	......	7.1	27	4.0	16	5.6	3.1
Troy, N. Y	154	14	4.5	12, 28	1.5	3	3.4	3.0
Albany, N. Y	147	12	5.0	29	0.8	5	3.0	4.2
Pompton River.								
Pompton Plains, N. J	6	8	5.5	15	3.8	1-9	3.8	1.7
Passaic River.								
Chatham, N. J	69	7	6.0	15	2.1	13, 14	3.0	3.9
Schuylkill River.								
Reading, Pa	66	12	1.5	15	0.0	7, 8, 28, 29	0.2	1.5
Delaware River.								
Hancock (E. Branch), N. Y	269	12	4.0	16	2.8	14	3.2	1.2
Hancock (W. Branch), N. Y	269	10	5.1	25	2.9	23	3.7	2.2
Phillipsburg, N. J	142	26	3.4	16	0.9	9, 13, 14	1.5	2.5
Trenton, N. J. ([2])	92	18	6.0	15	0.7	10	1.2	5.3
North Branch Susquehanna.								
Binghamton, N. Y	306	16	3.4	27	2.1	11, 13, 14	2.5	1.3
Towanda, Pa	262	16	2.6	26	0.7	3, 10-15	1.1	1.9
Wilkesbarre, Pa	183	17	5.5	27	3.1	14	3.9	2.4
West Branch Susquehanna.								
Lockhaven, Pa	65	12	− 2.0	1-30	− 2.0	1-30	−2.0	0.0
Williamsport, Pa	39	20	1.1	30	0.2	7-11, 22-25	0.4	0.9
Juniata River.								
Huntingdon, Pa	90	24	3.1	1-5, 10, 11	3.0	6-9, 12-30	3.0	0.1
Susquehanna River.								
Harrisburg, Pa	69	17	3.1	18	1.6	8, 9	2.0	1.5
Shenandoah River.								
Riverton, Va	58	22	0.5	1-30	0.5	1-30	0.5	0.0
Potomac River.								
Cumberland, Md	290	8	0.6	1	0.0	15-30	0.1	0.6
Harpers Ferry, W. Va	172	18	− 0.4	12, 13, 16	− 1.0	10, 24, 25, 29, 30	−0.7	0.6
James River.								
Buchanan, Va	305	12	1.9	2-6, 11, 17	1.8	1, 7-10, 18-30	1.9	0.1
Lynchburg, Va	260	18	0.3	1-6	0.0	23-30	0.0	0.3
Columbia, Va	167	18	4.3	15	1.9	28	2.3	2.4
Richmond, Va	111	12	1.1	16	− 0.7	7-9, 22-25, 27, 30	−0.4	1.8
Dan River.								
Danville, Va	55	8	1.4	3	− 0.3	14, 24-30	0.1	1.7
Roanoke River.								
Clarksville, Va. ([2])	196	12	7.2	15	2.0	29, 30	3.0	5.2
Weldon, N. C	129	30	31.2	16	8.2	29	10.7	23.0

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TABLE VII.—*Heights of rivers referred to zeros of gages.*—Continued.

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
	Miles.	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
Cape Fear River.								
Fayetteville, N. C	112	38	50.0	17	3.8	14	13.3	46.2
Waccamaw River.								
Conway, S. C	40	7	7.6	17	3.0	6	5.2	4.6
Pedee River.								
Cheraw, S. C	149	27	12.2	6	1.7	29, 30	4.0	10.5
Smiths Mills, S. C	51	16	12.7	9, 10, 21	5.6	30	11.2	7.1
Lynch Creek.								
Effingham, S. C	35	12	10.0	5	4.0	29, 30	5.8	6.0
Black River.								
Kingstree, S. C	45	12	7.5	16	3.2	30	5.5	4.3
Catawba River.								
Mount Holly, S. C	28	15	3.8	5	1.5	25-28, 30	1.9	2.3
Wateree River.								
Camden, S. C	37	24	13.0	6, 7	3.5	27	5.9	9.5
Congaree River.								
Columbia, S. C	52	15	1.0	6	— 1.4	30	0.0	2.4
Santee River.								
St. Stephens, S. C	50	12	8.6	7	— 1.1	30	4.0	9.7
Edisto River.								
Edisto, S. C	75	6	4.6	12-14	1.0	28-30	2.8	3.6
Broad River.								
Carlton, Ga	30	11	3.2	5	1.5	30	1.9	1.7
Savannah River.								
Calhoun Falls, S. C	347	15	4.0	6	1.9	30	2.6	2.1
Augusta, Ga	268	32	11.5	7	4.4	30	6.4	7.1
Oconee River.								
Milledgeville, Ga	147	25	2.7	6	0.4	30	1.2	2.3
Dublin, Ga	79	30	1.1	8	— 1.2	27-30	-0.6	2.3
Ocmulgee River.								
Macon, Ga	203	18	4.7	6	0.1	30	1.2	4.6
Abbeville, Ga	96	11	9.4	1	0.6	30	2.2	8.8
Flint River.								
Woodbury, Ga	227	10	0.8	5	— 0.3	20	0.0	1.1
Albany, Ga	90	20	5.4	1	0.1	28-30	1.2	5.3
Chattahoochee River.								
Oakdale, Ga	305	18	1.8	6	0.0	27-30	0.5	1.8
West Point, Ga	239	20	2.5	6	1.3	20, 21, 27-30	1.7	1.2
Coosa River.								
Rome, Ga	271	30	0.9	1-3, 7	— 0.5	19-29	0.0	1.4
Gadsden, Ala	144	22	0.0	1	— 1.0	29, 30	-0.6	1.0
Lock No. 4, Ala	116	17	0.7	1	— 0.7	30	-0.2	1.4
Wetumpka, Ala	6	45	3.1	1	0.0	22-24	1.1	3.1
Tallapoosa River.								
Milstead, Ala	38	35	2.1	7	0.7	22	1.3	1.4
Alabama River.								
Montgomery, Ala	265	35	1.4	1	— 1.4	26	-0.6	2.8
Selma, Ala	212	35	2.9	1	— 1.4	25, 26	-0.2	4.3
Black Warrior River.								
Tuscaloosa, Ala	90	43	4.9	1	4.3	27, 28	4.6	0.6
Tombigbee River.								
Columbus, Miss	303	33	— 2.8	23-30	— 3.5	12-20	-3.2	0.7
Demopolis, Ala	155	35	— 2.3	1	— 3.4	21-24, 30	-3.0	1.1
Sabine River.								
Logansport, La	195	25	2.8	15, 16	0.2	3, 4	1.5	2.6
Orange, Tex	15	7	— 0.2	9-30	— 0.4	1-8	-0.3	0.2
Neches River.								
Rockland, Tex	105	20	0.8	16	— 0.4	1	0.0	1.2
Beaumont, Tex	18	10	2.0	28, 29	0.7	1	1.3	1.3
Trinity River.								
Dallas, Tex	320	25	7.9	17	2.3	1, 2	4.0	5.6
Riverside, Tex	112	40	6.9	11	— 0.6	4, 5	1.8	7.5
Liberty, Tex	20	25	8.3	15	3.6	6-7	5.1	4.7
Brazos River.								
Kopperl, Tex	345	21	3.2	15	— 1.6	3	1.3	4.8
Waco, Tex	285	24	6.4	9	2.8	3, 4	4.1	3.6
Hempstead, Tex	140	40	3.7	9, 13	— 1.7	8	0.9	5.4
Booth, Tex	61	39	3.3	1, 2	1.7	20-22	2.5	1.6
Colorado River.								
Ballinger, Tex	489	21	10.0	23	1.0	18, 19	2.5	9.0
Austin, Tex	214	18	5.5	5	0.7	4	2.7	4.8
Columbus, Tex	98	24	13.0	8	5.8	3, 5, 6	8.9	7.2
Red River of the North.								
Moorhead, Minn	418	26	8.3	6-9	7.7	1	8.0	0.6
Kootenai River.								
Bonners Ferry, Idaho	123	......	5.0	1	1.7	30	3.1	3.3
Pend d'Oreille River.								
Newport, Wash	86	......	0.9	1-4	— 0.6	25-30	1.5	1.5
Snake River.								
Lewiston, Idaho	144	24	2.0	1	1.4	21-23	1.6	0.6
Riparia, Wash	67	......	2.2	1-6	2.0	25-30	2.1	0.2
Columbia River.								
Wenatchee, Wash	473	40	12.4	1	6.8	30	9.7	5.6
Umatilla, Oreg	270	25	6.0	1	2.1	30	4.7	3.9
The Dalles, Oreg	166	40	8.1	1	4.1	30	6.3	4.0
Willamette River.								
Albany, Oreg	118	20	1.0	1-30	1.0	1-30	1.0	0.0
Salem, Oreg	84	20	0.4	1-6	0.3	7-30	0.3	0.1
Portland, Oreg	12	15	4.2	14	2.0	19, 20	3.2	2.2
Sacramento River.								
Red Bluff, Cal	265	23	5.7	24	0.3	1-20	0.9	5.4
Sacramento, Cal	64	25	12.0	26	8.2	21-23	9.1	3.8

(1) 15 days only. (2) 23 days only.

HAWAIIAN CLIMATOLOGICAL DATA.

By ALEXANDER McC. ASHLEY, Section Director, United States Weather Bureau.

GENERAL SUMMARY FOR SEPTEMBER, 1904.

Following is the summary of meteorological conditions in the Hawaiian Islands during September, 1904:

Approximate percentages of district rainfall as compared with normals: Hawaii, Hilo, 104 per cent; Hamakua, 303 per cent; Kohala, 206 per cent; Kona, 110 per cent; Kau, 280 per cent; Puna, 226 per cent; Maui, variable, from 110 per cent at Pauomalei to 317 per cent at Kula (Erehwon). Oahu: Honolulu district, 61 per cent; Koolau, variable, from 82 per cent at Kahuku to 263 per cent at Waimanalo. Kauai: Lihue, 144 per cent; Kilauea Plantation, 68 per cent; Waiawa, 143 per cent.

United States Weather Bureau, dew-point, 67°; relative humidity, 70 per cent. United States Magnetic Station, dew-point, 68°; relative humidity, 70 per cent. Kohala, dew-point, 69°; relative humidity, 79 per cent.

Hawaii.—Pepeekeo: Partial solar eclipse observed from 8:20 to 10:30 a. m. on the 9th; thunder on the 12th, 13th, and 14th; distant lightning on the 29th; heavy showers on the 12th and 29th; solar halo on the 30th.

The greatest monthly rainfall reported was 13.14 inches at Nahiku, Maui. The greatest 24-hour rainfall was 5.02 inches at Maunawili, Oahu, on the 14th.

Temperature table for September, 1904.

Stations.	Elevation.	Mean max.	Mean min.	Cor. av'ge.	Highest.	Lowest.
	Feet.	°	°	°	°	°
Hilo	50	......	......	......	......	......
Pepeekeo	100	81.7	71.2	76.4	84	69
Olaa Mill	210	84.1	61.6	72.8	87	59
Kohala	521	81.9	70.0	76.0	85	68
Waimea	2,730	......	......	......	......	......
Volcano House	4,000	75.0	54.9	65.0	80	52
Waiakoa	2,700	......	......	......	......	......
Keomuku	10	......	......	......	......	......
Kinau Street (Castle)	50	......	......	......	......	......
United States Weather Bureau	111	83.7	73.2	78.0	85	70
United States Magnetic Station	50	87.6	70.0	79.0	91	66
Ewa Mill	60	......	......	......	......	......
United States Experiment Station	350	87.3	71.6	79.0	89	69
Punahou	47	84.2	71.5	78.0	85	67
Kilauea	342	83.2	68.8	76.0	86	66
Kailua (Huelo)	......	85.9	64.0	75.0	95	64

Honolulu, Hawaii, latitude, 21° 19′ north, longitude 157° 52′ west; barometer above sea, 38 feet; gravity correction, —.057, applied.

Day.	Pressure.*		Air temperature.				Moisture.				Wind.				Precipitation.		Clouds.					
							8 a. m.		8 p. m.		8 a. m.		8 p. m.				8 a. m.			8 p. m.		
	8 a. m.	8 p. m.	8 a. m.	8 p. m.	Maximum.	Minimum.	Wet.	Relative humidity.	Wet.	Relative humidity.	Direction.	Velocity.	Direction.	Velocity.	8 a. m.	8 p. m.	Amount.	Kind.	Direction.	Amount.	Kind.	Direction.
1	29.93	29.92	79.0	76.1	85	72	70.0	64	69.0	70	se.	7	ne.	12	0.00	0.00	1	Cu.	se.	1	S.-cu.	ne.
2	29.95	29.97	80.2	77.8	84	72	70.9	63	70.1	68	e.	1	e.	3	0.00	0.00	2	Cu.	e.	1	S.-cu.	e.
3	29.98	29.95	79.5	78.3	84	76	70.5	64	69.1	63	e.	12	ne.	8	T.	0.00	6	Cu.	ne.	2	Cu.	e.
4	29.96	29.92	79.8	78.6	85	75	72.2	69	72.6	75	ne.	8	ne.	10	0.00	T.	1	Cu.	ne.	2	Cu.	ne.
5	29.92	29.89	78.8	75.9	81	74	73.7	79	73.4	89	sw.	2	ne.	2	T.	.44	4 3	Ci.-s. S.-cu.	w. ne.	10	N.	?
6	29.90	29.89	79.8	77.6	84	72	70.9	64	70.6	71	e.	3	ne.	2	T.	0.00	2 3	Ci. Cu.	w. ne.	1	S.-cu.	?
7	29.92	29.96	79.8	77.0	82	73	70.3	62	71.0	74	se.	13	e.	5	0.00	0.00	1 1	Ci.-s Cu.	calm. e.	1	S.-cu.	e.
8	30.00	29.99	80.0	78.5	85	75	70.5	62	69.5	64	e.	10	e.	9	T.	0.00	2 1	Ci.-s. Cu.	w. ne.	3	S.-cu.	e.
9	29.97	29.96	79.2	76.0	84	75	70.0	63	70.0	74	ne.	20	e.	5	T.	T.	3	Cu.	ne.	10	N.	?
10	29.98	29.95	80.5	78.2	84	76	69.8	59	69.2	63	e.	11	e.	11	.01	T.	1	Cu.	ne.	1	S.-cu.	e.
11	29.97	29.94	79.6	77.9	84	74	71.0	66	70.5	69	ne.	6	ne.	8	0.00	0.00	3	Cu.	e.	Few.	S.-cu.	calm.
12	29.96	29.94	79.9	77.8	84	75	70.3	62	70.3	69	ne.	10	e.	6	0.00	0.00	2 4	Ci. S.-cu.	w. ne.	8	S.-cu.	e.
13	29.96	29.93	77.7	77.9	82	75	72.0	76	71.2	72	ne.	4	ne.	3	0.00	T.	10	S.-cu.	ne.	10	S.-cu.	ne.
14	29.94	29.90	75.8	75.5	84	72	71.4	80	70.0	76	ne.	4	ne.	6	.10	.05	9	S.-cu.	ne.	1	S.-cu.	ne.
15	29.90	29.93	79.0	78.0	82	70	73.0	75	73.0	79	se.	5	se.	4	0.00	0.00	3	Cu.	e.	8	Cu.	e.
16	29.96	30.01	77.9	78.0	82	71	74.4	85	72.0	75	nw.	3	ne.	2	.66	T.	7	S.-cu.	calm	1	S.-cu.	ne.
17	30.02	30.01	80.0	78.0	84	74	71.9	68	69.0	63	ne.	3	e.	3	0.00	0.00	2	Cu.	ne.	Few.	Cu.	e.
18	29.99	29.99	80.1	77.0	84	74	71.0	64	69.0	67	ne.	12	e.	2	0.00	0.00	1	Cu.	se.	8	Ci.-s.	w.
19	29.97	29.99	80.3	78.5	85	73	71.3	64	70.0	66	e.	10	e.	5	0.00	T.	1	Cu.	e.	5 3	Ci.-s. Ci.-cu.	calm. w.
20	30.01	30.00	79.0	78.0	85	73	70.1	64	69.0	63	se.	12	ne.	8	0.00	0.00	2	Cu.	e.	1	Cu.	e.
21	29.99	29.99	78.0	76.5	83	74	70.8	70	70.0	72	ne.	4	ne.	3	.01	.04	8	N.	ne.	2	Cu.	ne.
22	29.98	29.98	77.8	76.3	85	73	71.8	75	71.0	77	ne.	4	n.	3	T.	T.	2 3	Cu. N.	ne. ne.	6	Cu.	ne.
23	29.97	29.98	80.0	76.1	85	74	71.0	64	69.1	70	ne.	4	se.	3	0.00	T.	1	Cu.	e.	1	Cu.	e.
24	29.98	29.97	78.0	74.5	84	70	70.0	67	69.5	78	ne.	10	ne.	13	0.00	.08	1	Cu.	e.	1 5	Cu. N.	ne. ne.
25	29.94	29.93	78.0	77.0	83	72	71.4	73	68.5	65	ne.	9	e.	5	T.	0.00	2	Cu.	e.	Few.	Cu.	calm.
26	29.92	29.90	78.2	77.5	84	72	70.0	66	70.0	69	w.	4	e.	2	0.00	0.00	1 1	Ci.-s. Cu.	calm. e.	3 1	Ci.-s. Cu.	calm. e.
27	29.88	29.86	79.7	78.1	84	72	71.8	68	72.1	75	ne.	5	n.	3	0.00	T.	2	Cu.	calm.	8	S.-cu.	ne.
28	29.84	29.84	81.4	79.1	83	73	73.5	69	71.2	68	ne.	1	ne.	4	0.00	.01	1	Cu.	e.	5	S.-cu.	ne.
29	29.84	29.84	79.6	78.3	83	73	73.8	76	71.1	70	ne.	1	ne.	4	T.	0.00	9	S.-cu.	w.	4	S.-cu.	ne.
30	29.88	29.86	78.9	77.2	83	73	70.0	64	72.0	78	se.	2	ne.	5	0.00	0.00	9	Ci.-cu.	calm.	2	S.-cu.	ne.
31																						
Mean	29.95	29.94	79.2	77.4	84	73	71.3	68	70.4	71	ne.	6.7	ne.	5.3	0.78	0.62	3.8	Cu.	ne.	3.8	S.-cu.	ne.

Observations are made at 8 a. m. and 8 p. m., local standard time, which is that of 157° 30′ west, and is 5h and 30m slower than 75th meridian time. * Pressure values are reduced to sea level and standard gravity

Rainfall data for September, 1904.

Stations.	Elevation.	Amount.
HAWAII.		
HILO, e. and ne.	*Feet.*	*Inches.*
Waiakea	80	8.49
Hilo (town)	100	7.24
Kaumana	1,050	11.13
Pepeekeo	100	8.32
Hakalau	200	11.37
Honohina	300	12.26
Puuohua	1,050	9.52
Laupahoehoe	500	6.63
Ookala	400	5.40
Puueo	85	6.98
HAMAKUA, ne.		
Kukaiau	250	5.62
Paauilo	300	5.05
Paauhau	300	5.08
Honokaa (Mill)	470	8.08
Honokaa (Meinicke)	1,100	5.88
Kukuihaele	700	6.88
Paauhau	1.150	4.72
Paapau	......	....
KOHALA, n.		
Awini Ranch	1,100	....
Niulii	200	4.43
Kohala (Mission)	521	3.96
Kohala (Sugar Co.)	270	....
Hawi Mill	......	....
Puakea Ranch	600	1.48
Puuhue Ranch	1,847	1.64
Waimea	2,720	4.62
Halawa	450	4.37
KONA, w.		
Huehue	2,000	4.66
Holualoa	1,350	10.76
Kaukahoku Leheula	......	....

Stations.	Elevation.	Amount.
HAWII—*Cont'd.*	*Feet.*	*Inches.*
Kainaliu	......	....
Kealakekua	1,500	10.89
Napoopoo	25	4.80
Hoopuloa	1,650	3.54
Hoopuloa	2,300	10.11
Puuwaawaa Ranch	2,738	8.22
Huehue	......	....
KAU, se.		
Keaa Homesteads	2,000	12.31
Kahuku Ranch	......	....
Honuapo	25	3.66
Naalehu	650	7.12
Hilea	310	4.30
Pahala	850	3.56
Volcano House	4,000	4.06
Kau Station	1,850	10.64
PUNA, e.		
Olaa, Mountain View (Russel)	......	....
Olaa Plantation (Mill)	210	9.15
Olaa (20 miles)	......	....
Kapoho	110	12.49
Pahoa	600	10.65
MAUI.		
Lahaina	......	....
Waiopae Ranch	700	2.11
Kaupo (Mokulau), s	285	2.19
Kipahulu, s	308	4.70
Hana	......	....
Nahiku, ne	900	9.24
Nahiku	1.600	13.14
Haiku, n	700	1.63
Kula (Erehwon), n	4,000	6.68
Kula (Waiakoa), n	2,700	6.78
Puuomalei, n	1,400	3.01

Stations.	Elevation.	Amount.
MAUI—*Cont'd.*	*Feet.*	*Inches.*
Paia	180	1.15
Haleakala Ranch	2,000	1.15
Wailuku, ne	250	1.16
Kailua	......	8.49
LANAI.		
Keomuku	......	....
OAHU.		
U. S. Weather Bureau	108	1.40
Punahou (W. B.), sw	47	3.01
Kulaokahua (Castie), sw	......	....
Makiki Reservoir	......	....
U. S. Naval Station, sw	6	1.18
Kapiolani Park, sw	......	....
College Hill s	175	3.37
Manoa (Woodlawn Dairy), c	285	4.88
Manoa (Rhodes Gardens)	360	7.37
Insane Asylum	30	0.92
School street (Bishop), sw	......	....
Kamehameha School	......	....
Kalihi-Uka, sw	485	3.88
Nuuanu (W. W. Hall), sw	50	1.37
Nuuanu (Wyllie street)	250	1.93
Nuuanu (Elec. Station), sw	405	2.99
Nuuanu (Luakaha), c	850	6.96
U. S. Experiment Station	350	2.77
Kaliula	......	....
Laniakea (Nahuina)	......	....
Tantalus Heights (Frear)	1,360	5.35
Waimanalo, ne	25	4.08
Maunawili, ne	250	8.94
Kaneohe	100	7.29
Ahuimanu, ne	350	10.35
Kahuku, n	25	1.69
Waialua	......	....

Stations.	Elevation.	Amount.
OAHU—*Cont'd.*	*Feet.*	*Inches.*
Wahiawa	900	....
Ewa Plantation, s.	60	....
U. S. Magnetic Station	45	0.27
Waipahu	200	0.62
Moanalua	15	1.04
Pacific Heights	......	....
KAUAI.		
Lihue (Kilohana)	400	3.91
Lihue (Grove Farm), e.	200	3.49
Lihue (Molokoa), e.	300	3.30
Lihue (Kukaua), e.	1,000	4.53
Kealia, e.	......	....
Kilauea (Plantation), ne	342	2.87
Hanalei, n.	10	4.00
Waioli	......	....
Haena	......	....
Waiawa	30	1.89
Eleele	150	....
Wahiawa (Mountain)	2,000	....
McBryde (Residence)	900	2.00
Lawai (Gov. Road)	450	3.67
Lawai, w	225	1.05
Lawai, e.	800	3.15
Koloa	100	0.87
Lawai Beach	......	....
Wahiawa (New Mill)	......	....
Delayed reports.		
Hoopuloa	......	....
Puueo	......	....
Puuohua	......	....
Halawa	......	3.60
Olaa Mill	......	12.96
Nahiku	......	17.51
Haleakala	......	2.77

NOTE.—The letters n, s, e, w, and c show the exposure of the station relative to the winds.

COSTA RICAN CLIMATOLOGICAL DATA.

Communicated by Mr. H. PITTIER, Director, Physico-Geographic Institute.

TABLE 1.—*Hourly observations at the Observatory, San José de Costa Rica, during September, 1904.*

Hours.	Pressure.		Temperature.		Relative humidity.		Rainfall.		
	Observed, 1904.	Normal, 1889-1903.	Observed, 1904.	Normal, 1889-1903.	Observed, 1904.	Normal, 1889-1903.	Observed, 1904.	Normal, 1889-1903.	Duration, 1904.
	Inches.	*Inches.*	*° F.*	*° F.*	%	%	*Ins.*	*Ins.*	*Hrs.*
1 a. m	26.14	26.13	63.3	63.5	94	94	0.04	0.03	1.92
2 a. m	26.13	26.12	63.0	63.0	93	94	0.02	0.02	1.17
3 a. m	26.11	26.11	62.8	62.6	93	94	0.03	0.03	1.55
4 a. m	26.11	26.10	62.4	62.2	93	93	0.04	0.02	1.92
5 a. m	26.11	26.10	62.2	62.1	93	93	0.06	0.01	2.25
6 a. m	26.12	26.11	62.5	61.7	91	90	0.23	0.01	1.50
7 a. m	26.13	26.13	62.7	62.8	90	92	......	0.01	......
8 a. m	26.14	26.14	66.4	66.6	80	84	......	0.00	......
9 a. m	26.16	26.15	70.0	69.4	74	76	0.02	0.01	0.50
10 a. m	26.16	26.15	72.3	73.8	72	71	0.01	0.01	1.00
11 a. m	26.15	26.15	74.1	75.7	68	67	0.08	0.02	1.33
Noon	26.13	26.14	75.0	77.0	66	68	0.03	0.11	0.38
1 p. m	26.11	26.12	75.7	75.7	69	69	0.24	0.56	2.29
2 p. m	26.09	26.10	74.9	75.9	69	72	0.56	0.98	3.25
3 p. m	26.08	26.08	73.9	73.8	72	77	2.04	1.09	2.92
4 p. m	26.08	26.08	71.6	71.2	78	83	0.25	2.32	3.05
5 p. m	26.08	26.08	70.0	68.9	80	86	0.89	2.12	2.96
6 p. m	26.09	26.10	68.0	67.8	86	89	0.93	1.65	5.30
7 p. m	26.11	26.12	66.6	66.4	89	92	0.58	1.32	4.00
8 p. m	26.12	26.13	65.8	65.7	90	92	0.38	0.94	5.88
9 p. m	26.14	26.14	65.3	65.3	90	93	0.69	0.57	5.17
10 p. m	26.15	26.16	64.8	64.8	90	92	0.27	0.27	4.92
11 p. m	26.15	26.16	64.4	64.2	91	92	0.46	0.14	4.87
Midnight	26.15	26.15	63.7	63.9	93	93	0.13	0.06	3.00
Mean	26.12	26.12	67.6	67.6	85	85	......	......	......
Minimum	26.01	25.97	56.1	55.9	46	......	......	......	......
Maximum	26.22	26.23	......	86.0	100	......	......	......	......
Total	......	......	......	......	......	......	7.98	12.30	61.13

REMARKS.—At San José the barometer is 3,835 feet above sea level. Readings are corrected for gravity, temperature, and instrumental error. The hourly readings for pressure, and wet and dry bulb thermometers, are obtained by means of Richard registering instruments, checked by direct observations every three hours from 7 a. m. to 10 p. m. The thermometers are 5 feet above ground and are corrected for instrumental errors. The total hourly rainfall is as given by Hottinger's self-register, checked once a day. Under maximum, the greatest hourly rainfall for the month is given. The standard rain gage is 5 feet above ground. Since January 1, 1902, observations at San José have been made on seventy-fifth meridian time, which is 0 hours, 36 minutes, 13.3 seconds *in advance* of San José local time. The normals for pressure, temperature, and relative humidity have been adjusted to this time; the normal for rainfall in Table 1 and the sunshine observations and normal in Table 2 refer to local time. At Port Limon the hours of direct observation are 8 a. m., 2 and 8 p. m., San José local time; the barometer is 14 feet above sea level. The means for temperature and relative humidity in Table 4 are obtained from two-hourly readings given by a Richard self-registering thermometer.

TABLE 2.—*San José, September, 1904.*

Time.	Sunshine.		Cloudiness.		Temperature of the soil at depth of—				
	Observed, 1904.	Normal, 1889-1903.	Observed, 1904.	Normal, 1889-1903.	6 inches.	12 inches.	24 inches.	48 inches.	120 inches.
	Hours.	*Hours.*	%	%	*° F.*	*° F.*	*° F.*	*° F.*	*° F.*
7 a. m	8.61	9.23	64	55	69.3	69.6	70.5	70.5	70.3
8 a. m	19.80	20.32	......	......	......	......	......	......	......
9 a. m	19.63	21.95	......	......	......	......	......	......	......
10 a. m	16.46	21.81	67	62	69.8	69.3	70.5	70.5	......
11 a. m	12.91	19.64	......	......	......	......	......	......	......
Noon	8.65	16.33	......	......	......	......	......	......	......
1 p. m	8.50	12.81	81	86	69.8	69.6	70.5	70.5	......
2 p. m	7.82	11.86	......	......	......	......	......	......	......
3 p. m	9.69	8.94	......	......	......	......	......	......	......
4 p. m	5.63	4.72	96	93	70.3	70.0	70.5	70.3	......
5 p. m	3.70	2.39	......	......	......	......	......	......	......
6 p. m	0.25	0.76	......	......	......	......	......	......	......
7 p. m	......	......	86	91	70.3	70.2	71.2	70.3	......
8 p. m	......	......	......	......	......	......	......	......	......
9 p. m	......	......	......	......	......	......	......	......	......
10 p. m	......	......	67	76	70.2	70.2	70.7	70.3	......
11 p. m	......	......	......	......	......	......	......	......	......
Midnight	......	......	......	......	......	......	......	......	......
Mean	......	......	77	77	69.8	69.8	70.6	70.3	70.3
Total	122.74	150.58	......	......	......	......	......	......	......

TABLE 3.—*Rainfall at stations in Costa Rica, September, 1904.*

Stations.	Height above sea level.	Observed, 1904.		Averages.		
		Amount.	Number of days.	Number of years.	Amount.	Number of days.
	Feet.	*Inches.*			*Inches.*	
Sipurio (Talamanca)	197	......	......	4	9.49	18
Boca Banano	10	17.83	20	8	5.00	15
Bearesemt Farm	......	15.04	12	......	......	......
Port Limon	10	14.61	19	10	4.41	7
Coro Farm	......	25.35	24	......	......	......
Swamp Mouth	10	1.57	17	6	5.67	10
Zent	66	12.05	22	3	4.21	12
Victoria	......	46.97	27	......	......	......
Siquirres	197	0.63	9	6	4.29	11
Colombiana	......	17.40	27	......	......	......
Guapiles	984	12.87	27	4	15.59	17
San Carlos	528	16.77	23	6	12.52	22
Las Lomas	873	3.35	24	4	5.04	15
Peralta	1,089	2.40	29	6	10.16	18
Turrialba	2,034	8.70	16	9	7.32	16
Juan Viñas	3,412	1.73	9	8	5.43	12
Santiago	3,609	13.82	25	3	7.24	20
Cachi	3,346	10.24	29	3	5.75	17
Paraiso	4,383	12.95	30	3	7.60	14
Cartago	4,761	......	......	3	7.95	20
Tres Rios	4,265	13.03	20	15	12.09	19
San Francisco Guadalupe	3,894	9.17	22	8	11.10	22
San José	3,806	7.99	21	15	12.32	23
La Verbena	3,740	6.38	19	8	11.69	21
Nuestro Amo	2,595	7.05	13	8	10.12	20
Alajuela	3,117	8.46	19	4	9.69	21
San Isidro Alajuela	4,416	8.35	15	3	23.25	23
Puntarenas	......	5.24	12	......	......	......
Las Cañas	2,559	4.49	8	......	......	......

Notes on earthquakes.—September 11, 1^h 19^m a. m., pretty heavy shock N.-S., intensity III, duration 3 seconds; 2^h 55^m a. m., light shock NE.-SW., intensity I, duration 1 second. The first shock was felt in Port Limon.

CLIMATOLOGICAL DATA FOR JAMAICA.

Through the kindness of Mr. H. H. Cousins, chemist to the government of Jamaica and now in charge of the meteorological service of that island, we have received the following table in advance of the regular monthly weather report for Jamaica:

Comparative table of rainfall for September, 1904.

[Based upon the average stations only.]

Divisions.	Relative area.	Number of stations.	Rainfall.	
			1904.	Average.
	Per cent.		*Inches.*	*Inches.*
Northeastern division	25	25	5.66	8.01
Northern division	22	52	3.89	5.00
West-central division	26	26	9.98	9.85
Southern division	27	36	6.42	6.46
Means	100	139	6.49	7.33

The rainfall for September was, therefore, below the average for the whole island. The greatest rainfall, 27.20 inches, occurred at Carew Castle, in the central subdivision, while 0.69 inch was recorded at Day Harbor, in the northern division.

Chart I. Tracks of Centers of High Areas. September, 1904.

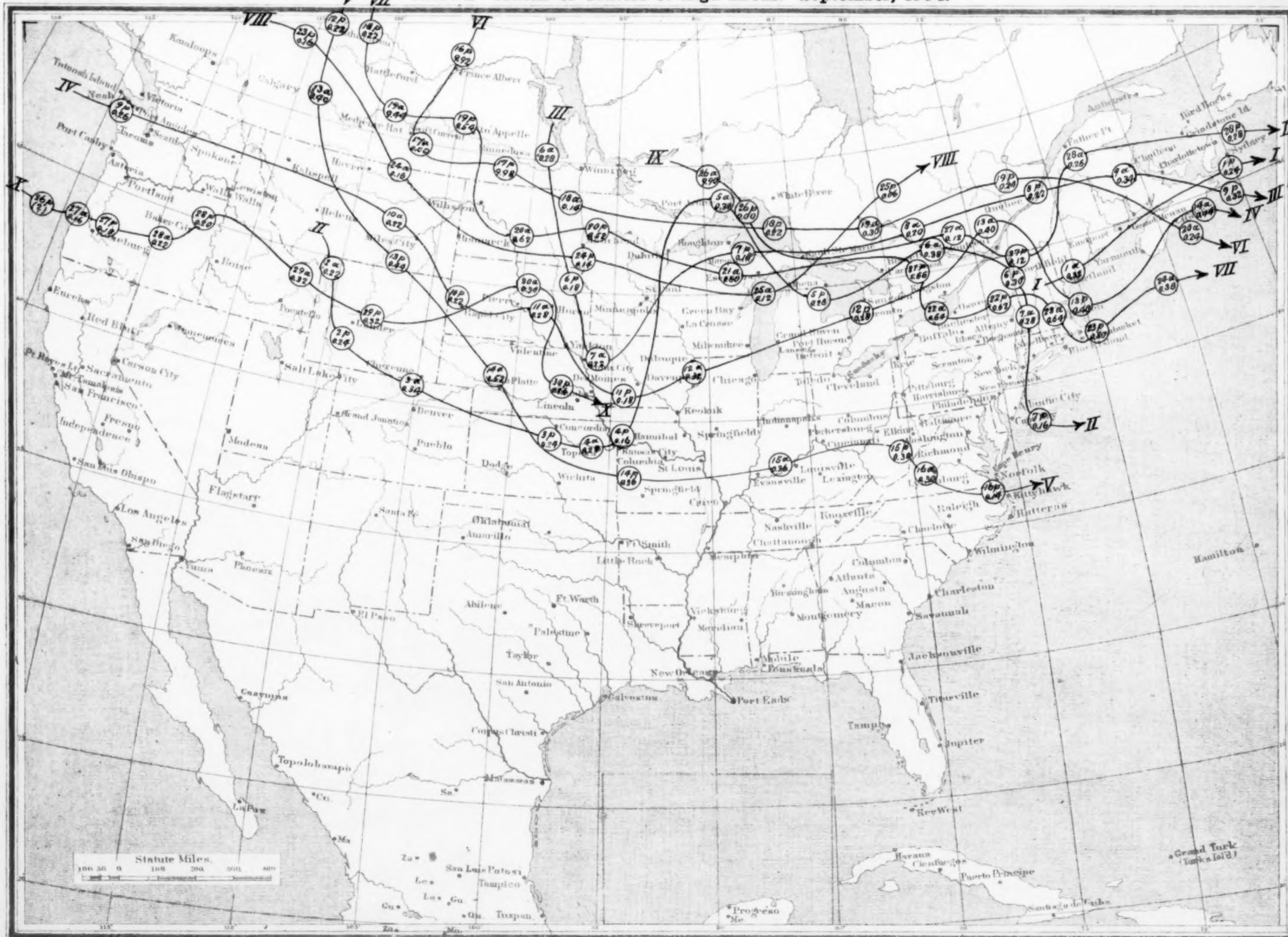

Chart II. Tracks of Centers of Low Areas. September, 1904.

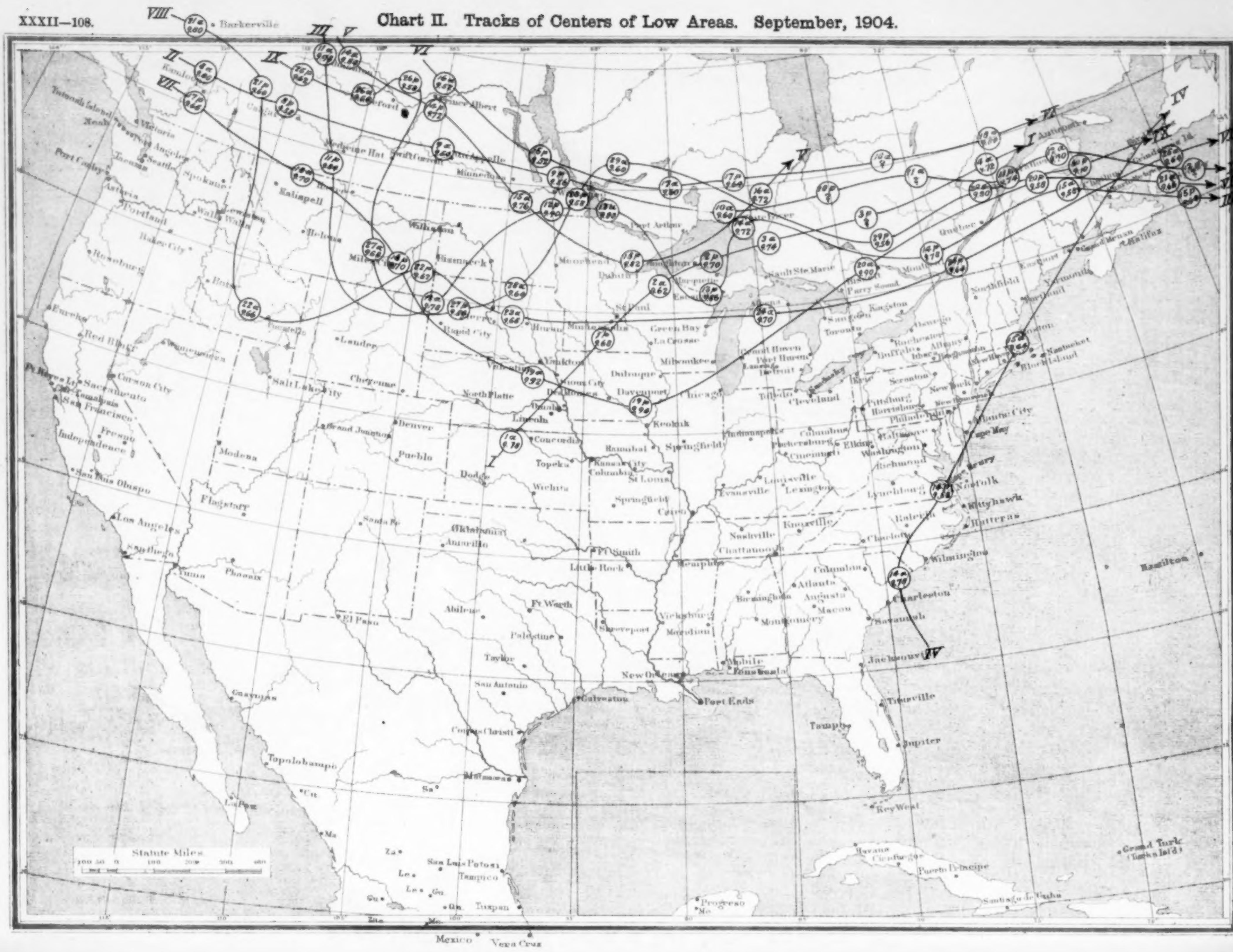

Chart III. Total Precipitation. September, 1904.

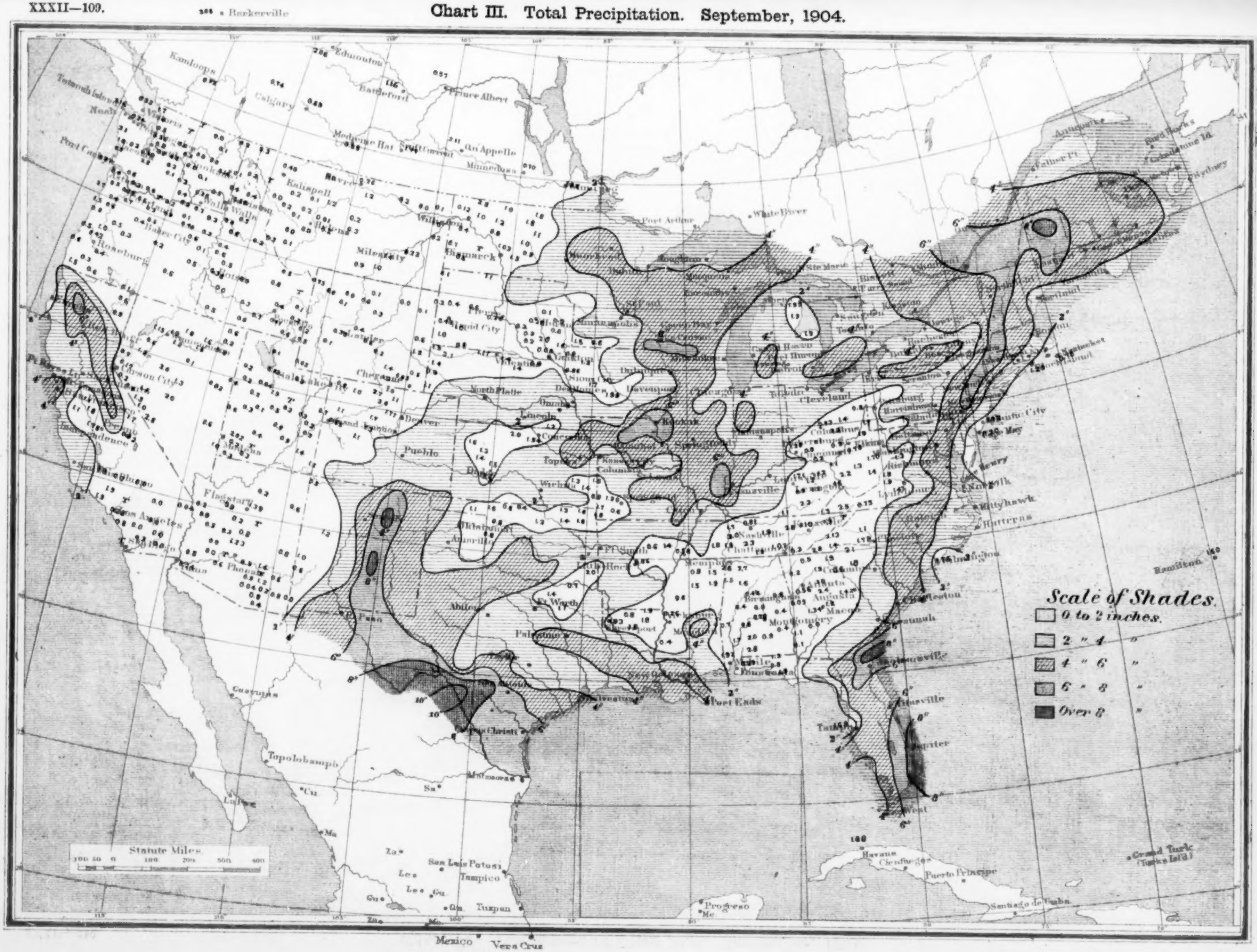

Chart IV. Percentage of Clear Sky. September, 1904.

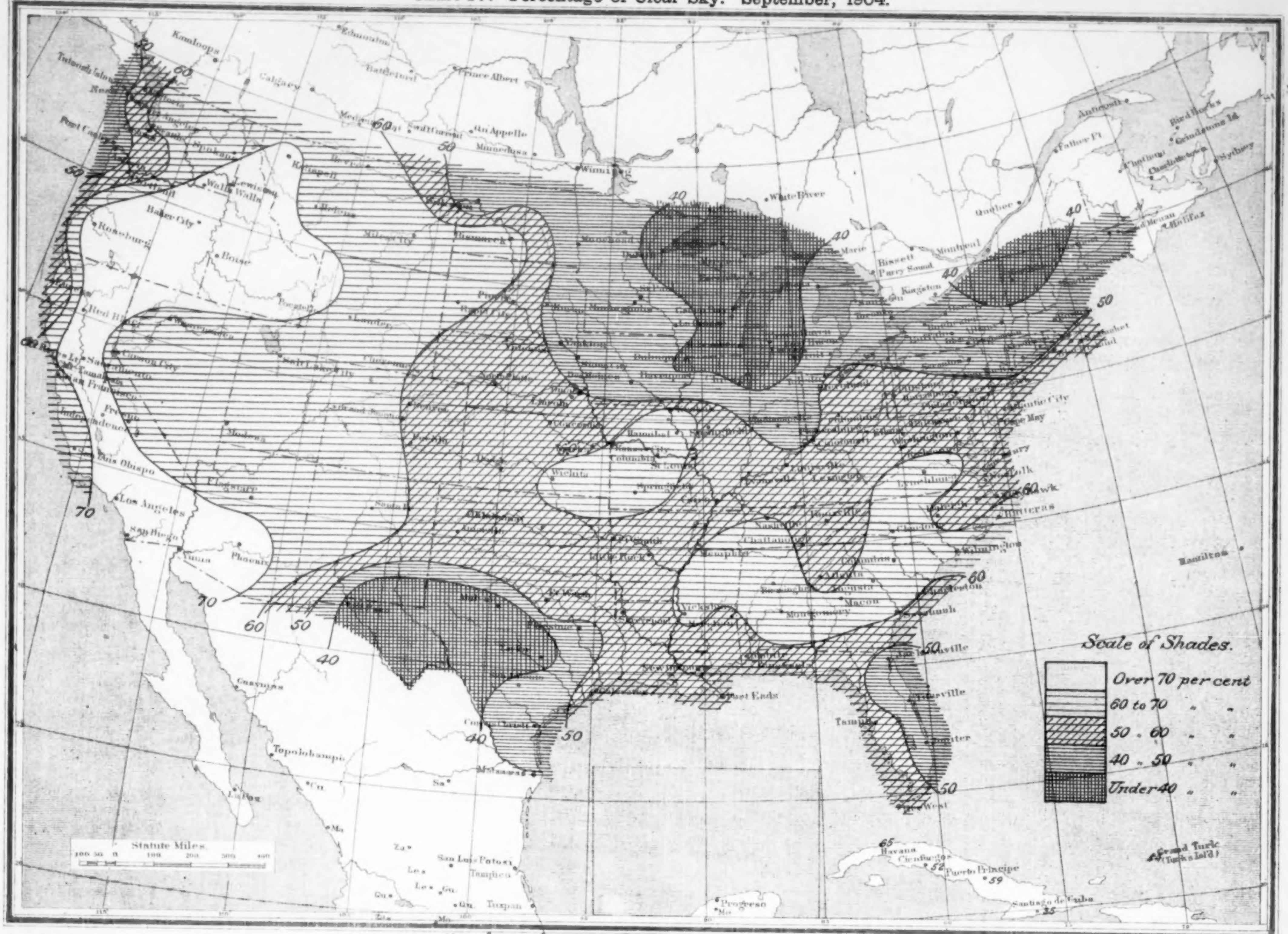

Chart V. Surface Temperatures; Maximum, Minimum, and Mean. September, 1904.

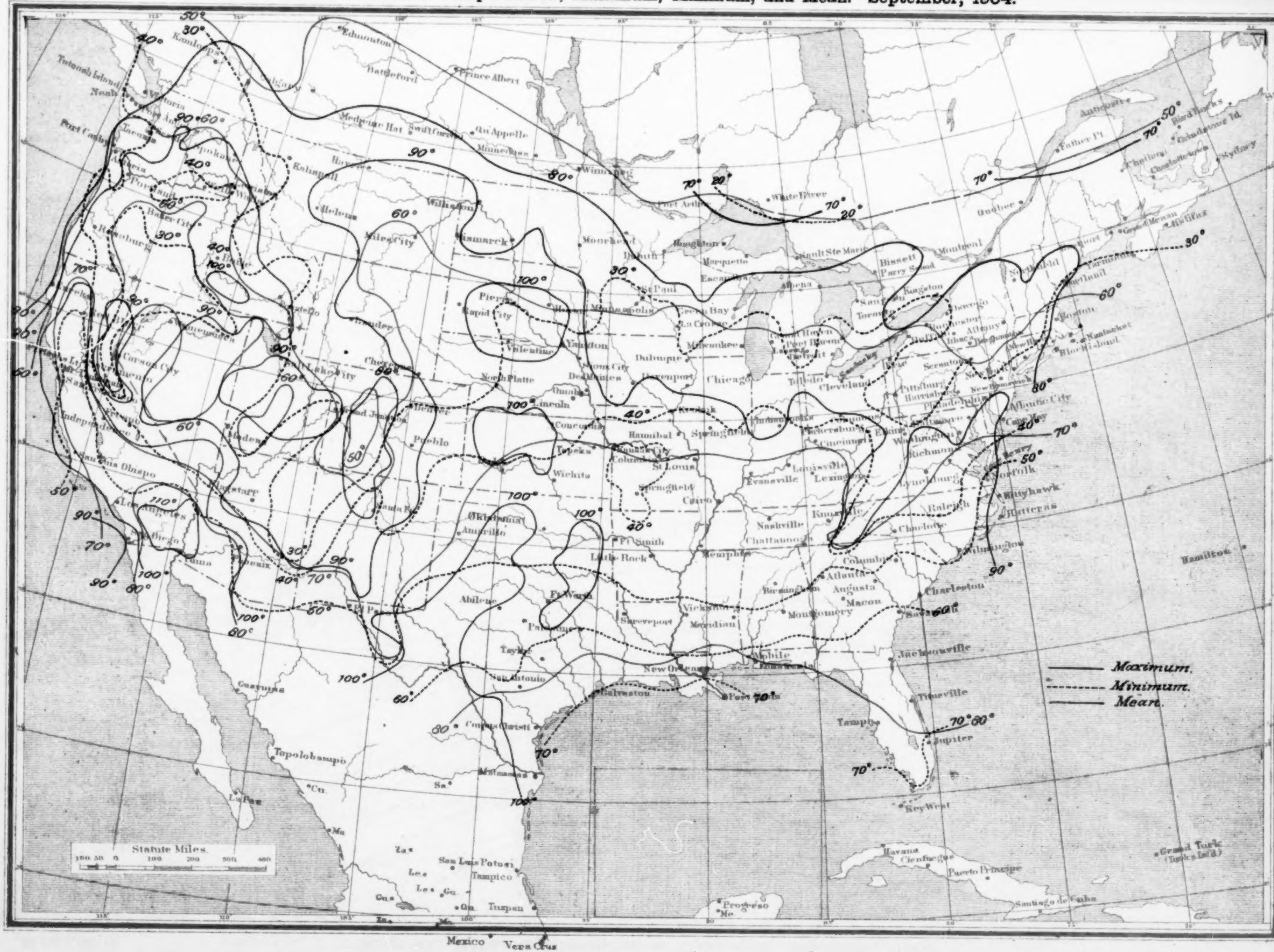

Chart VI. Isobars and Isotherms at 10,000 feet. September, 1904.

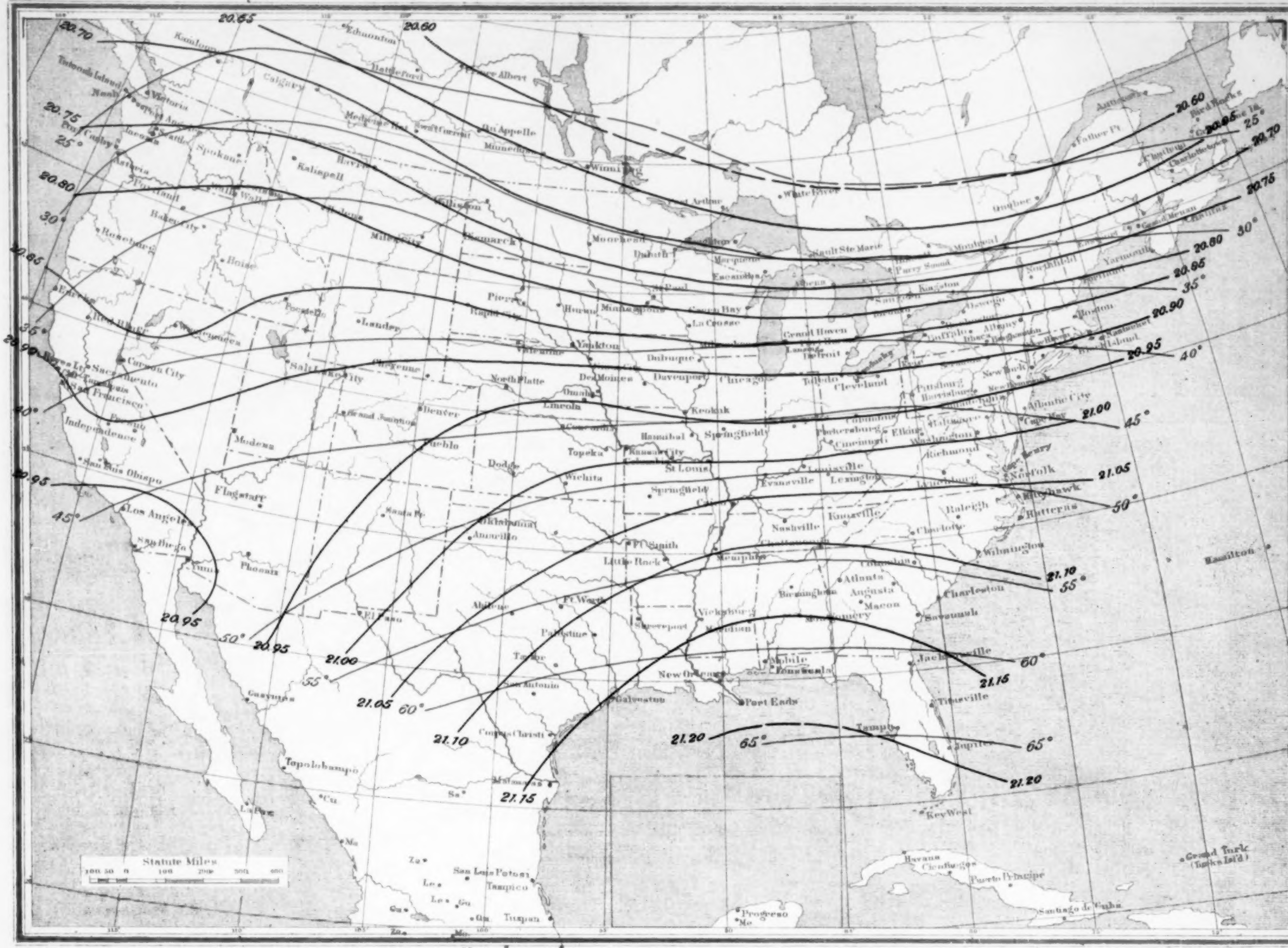

Chart VII. Isobars and Isotherms at 3500 feet. September, 1904.

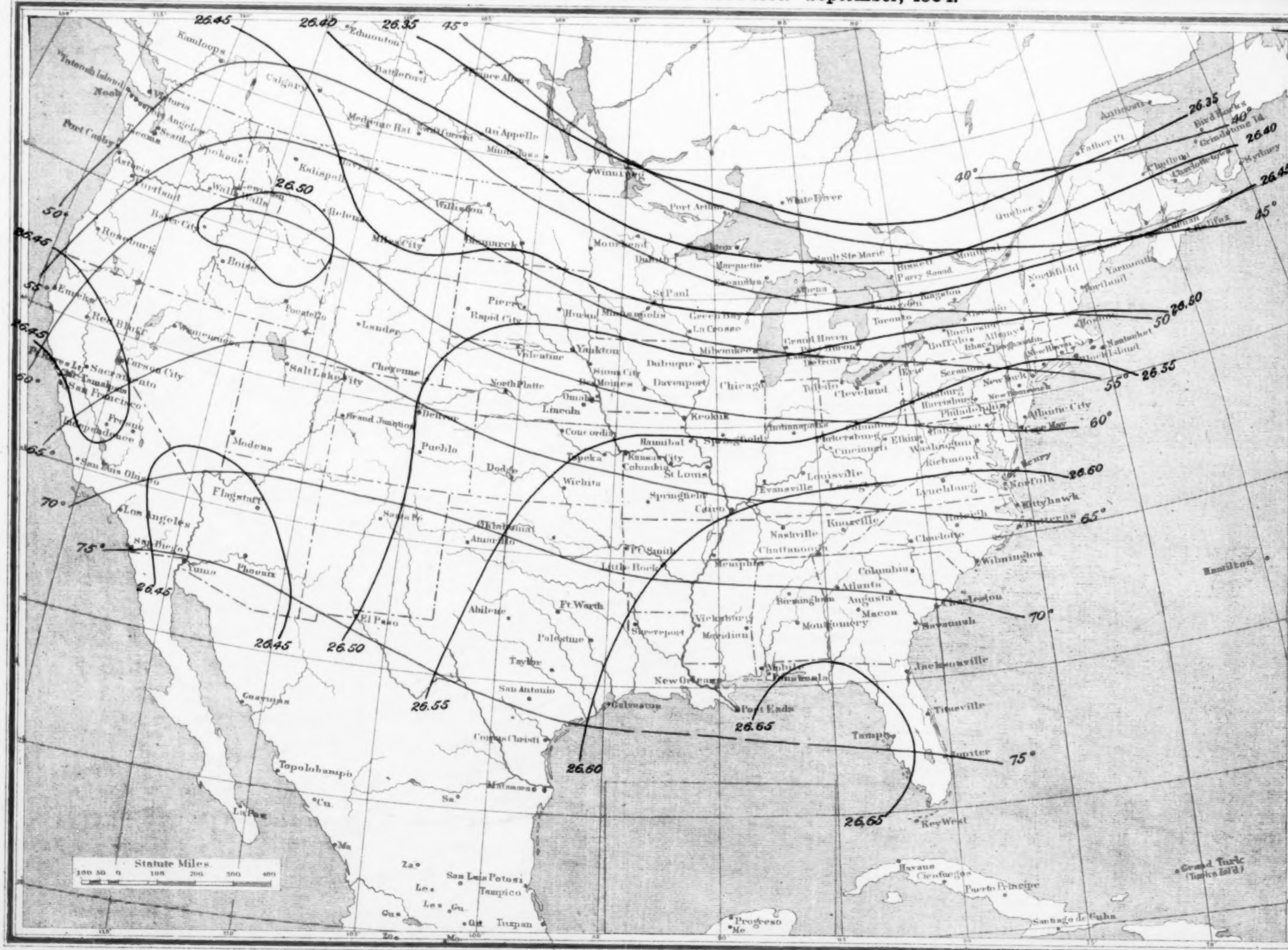

Chart VIII. Isobars and Isotherms at Sea Level; Resultant Surface Winds. September, 1904.

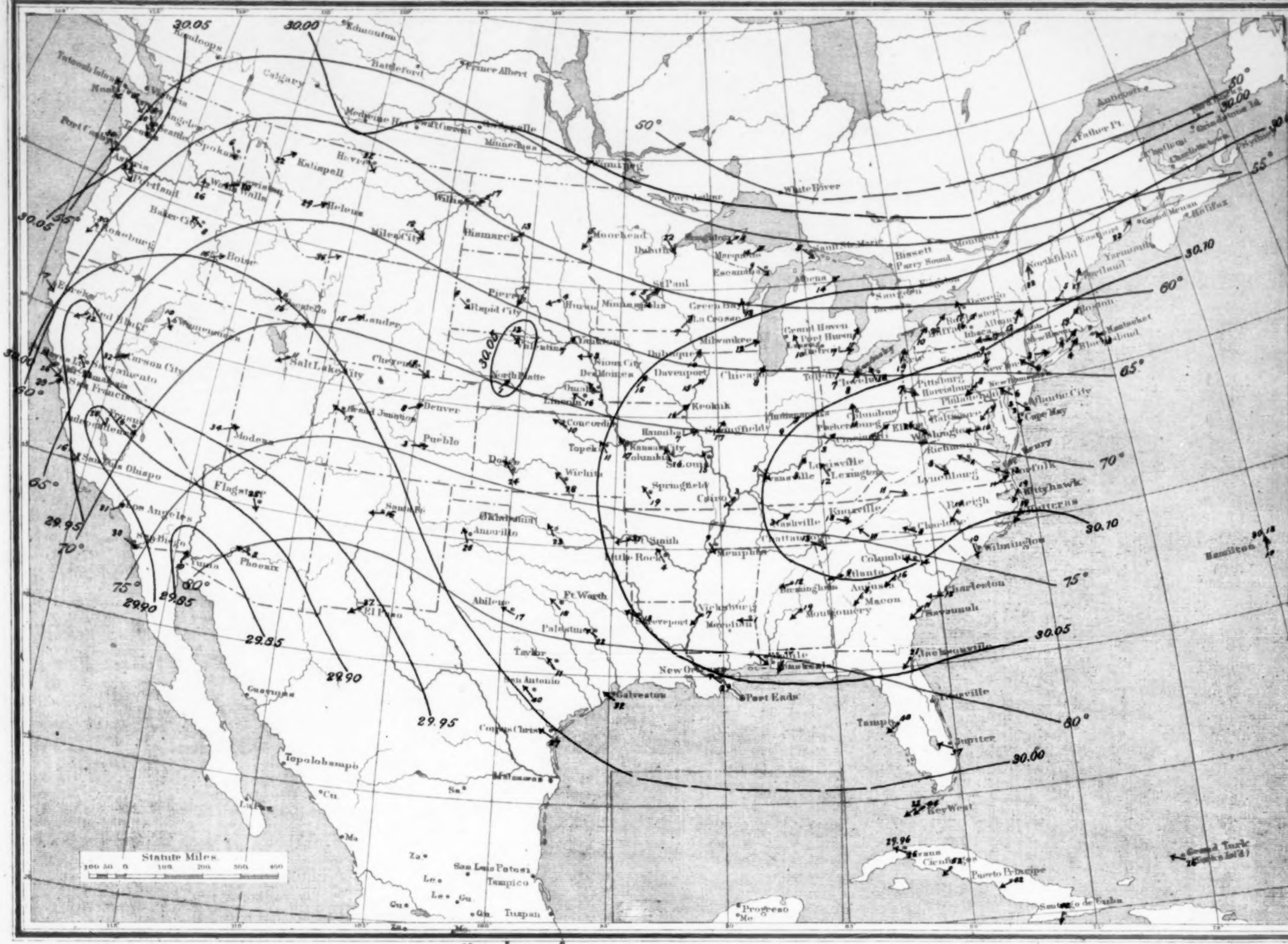

Chart IX. Sea-Level Isobars, Surface Temperatures, and Resultant Winds. September, 1904.

Chart IX. Sea-Level Isobars, Surface Temperatures, and Resultant Winds. September, 1904.

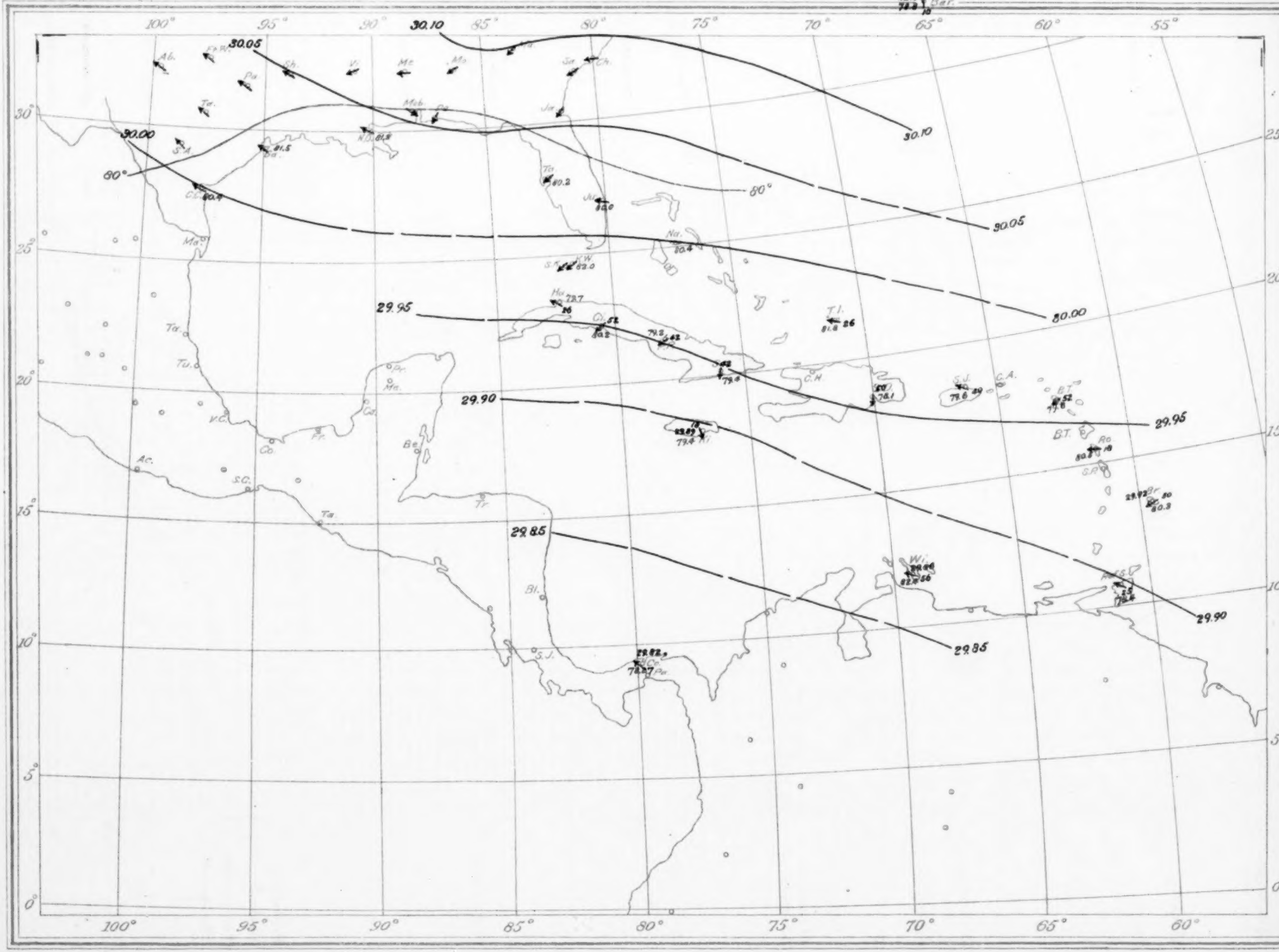

 Chart X. Hydrographs for Seven Principal Rivers of the United States. September, 1904.